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NATIONAL DAM INSPECTION PROGRAM. LAKE WILHELM DAM (NDI NUMBER P--ETC(U)

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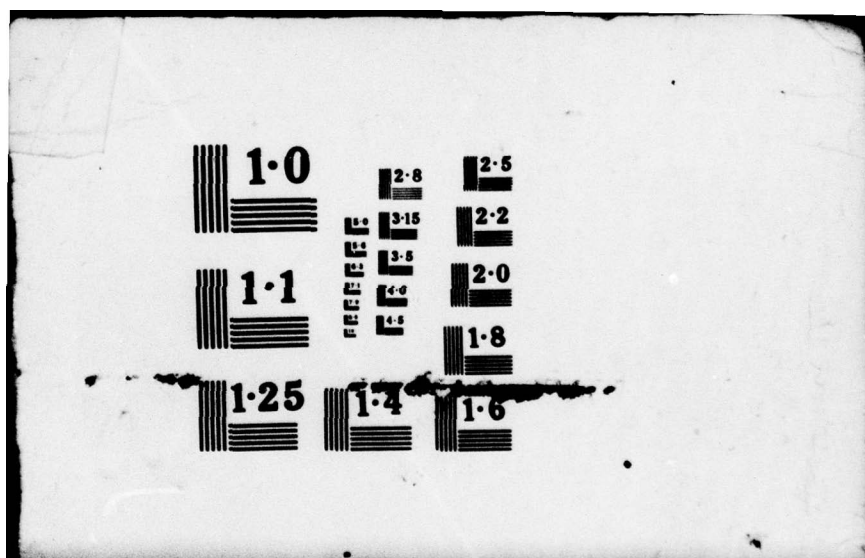
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OHIO RIVER BASIN  
SANDY CREEK, MERCER COUNTY  
PENNSYLVANIA

(1)  
P.S.

LEVEL II

LAKE WILHELM DAM

NDI No. PA 00900  
PennDER No. 43-53  
SCS No. PA 475

**PHASE I INSPECTION REPORT**  
**NATIONAL DAM INSPECTION PROGRAM**

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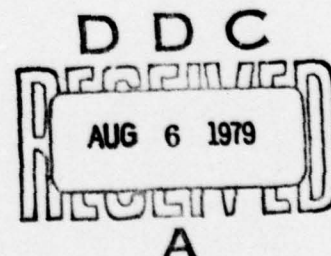


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prepared for

**DEPARTMENT OF THE ARMY**  
**Baltimore District, Corps of Engineers**  
Baltimore, Maryland 21203

prepared by  
**MICHAEL BAKER, JR., INC.**  
Consulting Engineers  
4301 Dutch Ridge Road  
Beaver, Pennsylvania 15009



July 1979

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OHIO RIVER BASIN

LAKE WILHELM DAM  
MERCER COUNTY, COMMONWEALTH OF PENNSYLVANIA  
NDI No. PA 00900  
PennDER No. 43-53  
SCS No. PA 475

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

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6 National Dam Inspection Program. Lake  
Wilhelm Dam (NDI Number PA-00900,  
PennDER Number 43-53, SCS Number PA-475),  
Ohio River Basin, Sandy Creek, Mercer  
County, Pennsylvania. Phase I Inspection Report,

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## PREFACE

This report was prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT  
NATIONAL DAM INSPECTION PROGRAM

Lake Wilhelm Dam, Mercer County, Pennsylvania  
NDI No. PA 00900, PennDER No. 43-53, SCS No. PA 475  
Sandy Creek  
Inspected 19 April 1979 and 4 June 1979

ASSESSMENT OF  
GENERAL CONDITIONS

Lake Wilhelm Dam, approximately 41 feet high and 500 feet long, is a zoned earth embankment with a compacted fill cutoff trench. The dam is owned and operated by the Pennsylvania Department of Environmental Resources (PennDER), Bureau of State Parks. Lake Wilhelm Dam is categorized as a "High" hazard-"Large" size dam.

Hydraulic/hydrologic evaluations performed in accordance with procedures established by the Baltimore District, U.S. Army Corps of Engineers for Phase I Inspection Reports, revealed that the spillway will pass the Probable Maximum Flood (PMF) without overtopping the dam. Therefore, the spillway is assessed as "adequate".

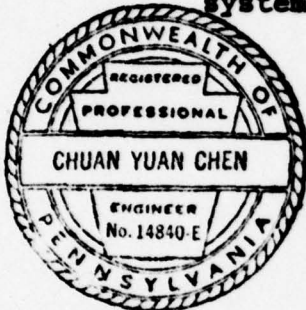
The visual inspection and review of engineering data, made in April and May of 1979, revealed some problems that require remedial treatment but do not constitute any emergency conditions. The dam appeared to be in good overall condition at the time of the inspection. However, it is recommended that the owner:

- 1) Initiate a monitoring program for the marshy areas to determine if quality or quantity changes take place and to institute appropriate action if required.
- 2) Develop a program whereby the movement of the riser could be monitored and appropriate remedial measures taken if required.
- 3) Repair eroded areas in the embankment by grading, treating and reseeding with an appropriate mixture to prevent erosion.
- 4) Install a permanent walkway or make necessary repairs on the downstream slope between the parking lot and crest of the dam.

- 5) Remove the vegetation growing within the riprapped areas.
- 6) Repair the concrete on the outlet head wall.

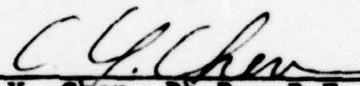
In addition, the following operational measures are recommended to be undertaken by the owner:

- 1) Develop a detailed emergency operation and warning system.
- 2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.
- 3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.



Submitted by:

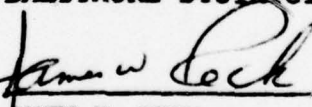
MICHAEL BAKER, JR., INC.

  
C. Y. Chen, Ph.D., P.E.  
Engineering Manager-Geotechnical

Date: 12 July 1979

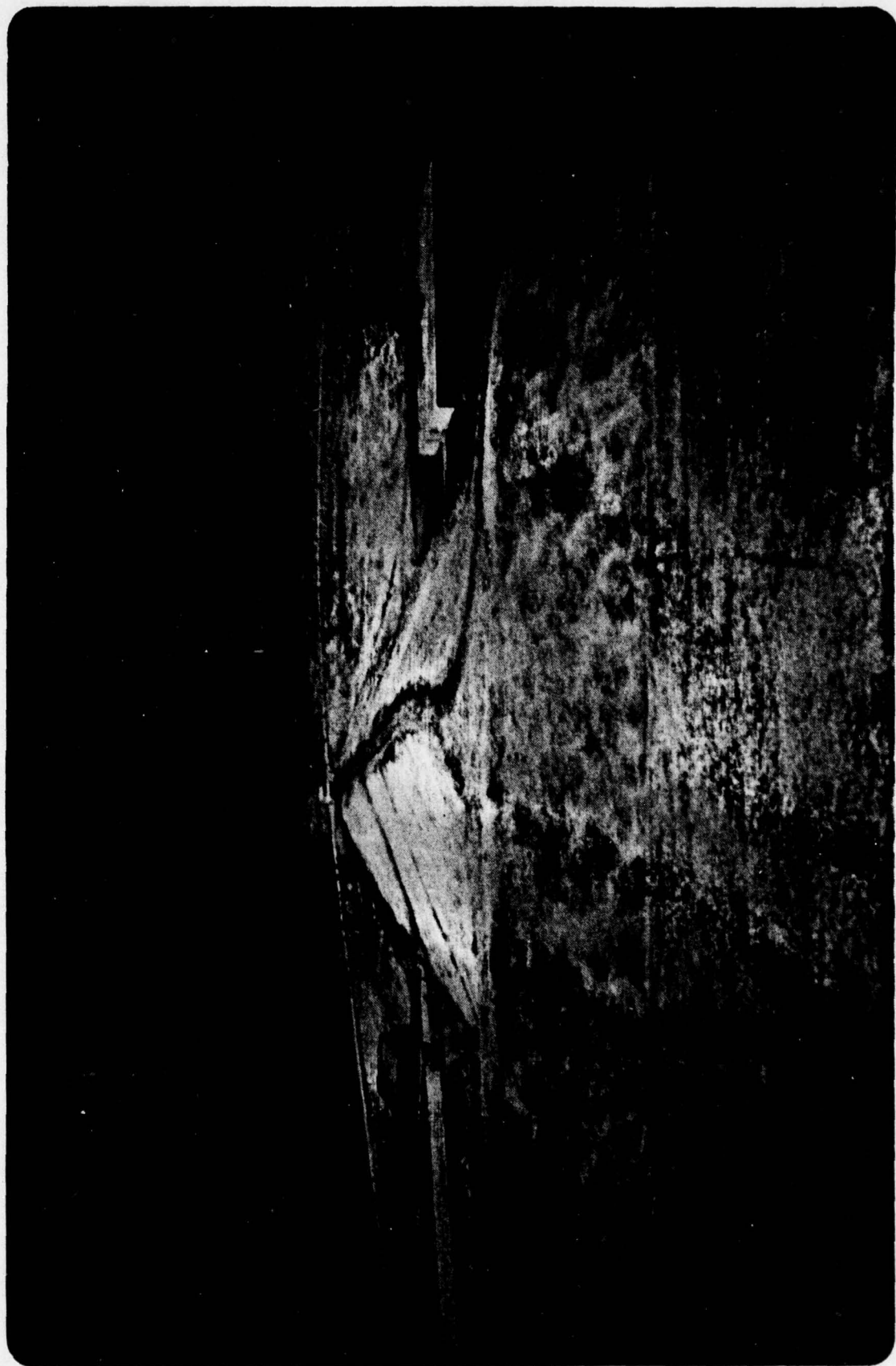
Approved by:

DEPARTMENT OF THE ARMY  
BALTIMORE DISTRICT, CORPS OF ENGINEERS

  
JAMES W. PECK  
Colonel, Corps of Engineers  
District Engineer

Date: 21 July 1979

**LAKE WILHELM DAM**



**Overall View**



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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM  
LAKE WILHELM DAM  
NDI No. PA 00900, PENNDER No. 43-53, SCS No. PA 475

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

- a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.
- b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

- a. Description of Dam and Appurtenances - Lake Wilhelm Dam, also known by its U.S. Department of Agriculture, Soil Conservation Service (SCS) number PA 475, was built for flood control and recreation. The dam, which was designed by the SCS, is a zoned earth embankment with a crest length of approximately 500 feet and a maximum height of 41.5 feet. The upstream face has a slope of 3H:1V (Horizontal to Vertical) to El. 1191.5 feet and a 2.5H:1V slope to the top of dam El. 1211.5 feet. To increase structural stability, two 4-foot berms are located at El. 1191.5 feet and 1194.5 feet, a 20-foot berm is at El. 1189.0 feet, and a 10-foot berm is at El. 1180.0 feet. The downstream face has a slope of 2.5H:1V and the crest width is 16 feet.

A 4-foot wide foundation drain trench containing granular material was installed to a maximum depth of about 8 feet beneath the downstream toe of the dam. Sections of this trench in the valley bottom contain 12-inch diameter perforated corrugated metal collector pipes which discharge from the sides of the reinforced concrete outlet structure at the downstream toe of the dam. Toe drains of granular material and rockfill were installed along portions of the contacts of the downstream slope with both abutments.



The outlet works (principal spillway in SCS terminology) consists of a reinforced concrete two stage riser inlet structure connected to two 6-foot-square concrete conduits which are approximately 150 feet long. The low stage overflow is at El. 1192.2 feet with the high stage weir constructed at El. 1194.7 feet. The outlets of the riser structure, located beneath the embankment, are contained in a reinforced concrete box culvert fitted with seven anti-seep collars. The downstream end of the outlet pipe discharges into a reinforced concrete impact basin, the design of which is based on the Saint Anthony Falls (SAF) research. Chute blocks, baffle blocks and an end sill are provided. The length of the basin is 54 feet and the width between training walls is 22 feet. The reinforced concrete riser unit is a large drop-inlet type spillway. The concrete box has four openings on each side. Each opening has a weir length of 15 feet. The pond drain consists of two 66-inch-square manually operated sluice gates.

The emergency spillway is located along the left abutment. The channel is a vegetated earth type with an overall length of 500 feet and a bottom width of 80 feet. The right side of the channel has a side slope of 3H:1V and the left side slope measures 2.5H:1V. The entrance section of the earth spillway rises from the reservoir at a 0.1 percent slope to the crest of the 100-foot long control section (El. 1199.0 feet). From the control section to the downstream channel, the profile of the emergency spillway declines at a slope of 2.0 percent.

- b. Location - Lake Wilhelm Dam is located on Sandy Creek approximately 6 miles northwest of its confluence with French Creek in Sandy Lake Township, Mercer County, Pennsylvania. The dam is located 0.6 mile from the intersection of PA Route 173 and PA L.R. 43068, and approximately 1.0 mile from the center of Sandy Lake, Pennsylvania. The dam can be located on USGS Quadrangle, Sandy Lake, Pennsylvania, with coordinates N 41° 22' 12" - W 80° 05' 12". The location of Lake Wilhelm Dam is shown on Plate 1.
- c. Size Classification - The maximum height of the dam is 41.5 feet and the reservoir volume to dam crest is 66,400 acre-feet. The dam is therefore in the "Large" size category.

- d. Hazard Classification - Due to the proximity of several homes immediately downstream and the town of Sandy Lake, Pennsylvania located approximately 1.0 mile from the dam, many lives could be lost in the event of a dam failure. Therefore, the dam is classified in the "High" hazard category.
- e. Ownership - The dam is owned by the Mercer County Commissioners, Mercer County Courthouse, Mercer, Pennsylvania 16137.
- f. Purpose of Dam - Lake Wilhelm Dam is used for floodwater detention and also for recreation in conjunction with the Maurice K. Goddard State Park.
- g. Design and Construction History - Lake Wilhelm Dam was designed by the SCS under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566, as amended. The dam was constructed by Brodhead Construction Company of Aliquippa, Pennsylvania from August 1967 through October 1969. Two work stoppages occurred during the construction; one was caused by severe weather in the Winter of 1967 and the other was a scheduled six-month shutdown. A portion of the embankment (approximately 10,000 C.Y. or one-sixth of the total) was placed between the dates of 11 August 1967 and 1 September 1968. At this time the work was suspended for 6 months or until the fill settlement had reached the required level. The following year on 26 May 1969 the contractor resumed operations and after removing the first few feet of fill continued to build up the embankment and impermeable core until its completion in October 1969.
- h. Normal Operational Procedures - The lake is normally maintained at the low-level inlet of the riser structure, El. 1192.20 feet. There has reportedly been no major flood since the dam was constructed. The maximum height of the pool as marked on the riser structure is at El. 1193.50 feet. The dam is inspected on a yearly basis according to procedures for SCS dams. Routine maintenance is performed by the state park personnel.

### 1.3 PERTINENT DATA

a.	<u>Drainage Area (square miles) -</u>	56.5
b.	<u>Discharge at Dam Site (c.f.s.) -</u>	
	Maximum Known High Water at Dam Site (El. 1193.5 ft., June 1972) -	680
	Outlet Works at Maximum Pool (El. 1211.5 ft.) -	2365
	Spillway Capacity at Maximum Pool (El. 1211.5 ft.) -	8635
c.	<u>Elevation (feet above Mean Sea Level [M.S.L.]) -</u>	
	Design Top of Dam -	1211.5
	Actual Top of Dam -	Varies from 1211.8 to 1212.2
	Maximum Design Pool -	1211.5
	Riser Crest -	1192.2
	Emergency Spillway Crest -	1199.0
	Normal Pool -	1192.2
	Streambed at Centerline of Dam -	1170+
	Maximum Tailwater -	Not available
d.	<u>Reservoir (miles) -</u>	
	Length of Maximum Pool -	13.74
	Length of Normal Pool -	9.47
e.	<u>Storage (acre-feet) -</u>	
	Top of Dam (El. 1211.5 ft.) -	66,400
	Spillway Crest (El. 1199.0 ft.) -	31,250
	Normal Pool (El. 1192.0 ft.) -	17,825
f.	<u>Reservoir Surface (acres) -</u>	
	Top of Dam (El. 1211.5 ft.) -	3510
	Spillway Crest (El. 1199.0 ft.) -	2250
	Normal Pool (El. 1192.0 ft.) -	1680
g.	<u>Dam -</u>	
	Type - Zoned earth embankment containing 61,347 c.y. of fill	
	Length (feet) -	500
	Maximum Height (feet) -	41.5
	Crest Width (feet) -	16
	Side Slopes - Upstream -	
	to El. 1191.5 ft. -	3H:1V
	El. 1191.5 ft. to crest -	2.5H:1V
	Downstream -	2.5H:1V



Zoning - The center impervious zone consists of silty clayey sand (SC) provided with a cutoff trench. The upstream and downstream shell sections consist of gravelly (GP-GW) materials.

Cutoff - Compacted earth with maximum base width of 20 feet in foundation and lower abutments

Drains - Foundation drain trench with granular material and 12-inch diameter perforated corrugated metal collector pipes in valley bottom; toe drains of granular material and rockfill along portions of downstream slope junctions with both abutments.

h. Diversion and Regulating Tunnel - None

i. Spillway (Emergency Spillway in SCS Terminology) -

Type - Vegetated earth channel in left abutment

Length (feet along centerline) - 500

Base Width (feet) - 80

Side Slopes - Right Side 3H:1V

Left Side 2.5H:1V

Crest Elevation (feet M.S.L.) - 1199.0

Gates - None

Downstream Channel - Spillway exits into natural stream channel approximately 20 feet wide

j. Regulating Outlets - Two 66-inch-square, flange frame type control gates. The rising stem is constructed of 1.25-inch diameter stainless steel with a fully adjustable stem guide fitted with bronze bushings. The hand-operated crank is connected to the pedestal base lift with a bronze lift nut.

k. Principal Spillway -

Type - Two-stage inlet riser and two 6-foot-square concrete conduits

First Stage Orifice -

Crest Elevation (feet M.S.L.) - 1192.2

Width (feet) - 8 each at 15.0

Vertical Clearance (feet) - 5.00

Second Stage Orifice -

Crest Elevation (feet M.S.L.) - 1194.7

Width (feet) - 8 each at 15.0

Vertical Clearance (feet) - 2.50

Outlet Pipe - Consists of two 6-foot-square concrete conduits approximately 150 feet long. The outlets are contained in a reinforced concrete box culvert fitted with seven anti-seep collars.

Riser Floor Invert Elevation	
(feet M.S.L.) -	1169.2
Outlet Conduit Exit Invert Elevation	
(feet M.S.L.) -	1162.8

## SECTION 2 - ENGINEERING DATA

### 2.1 DESIGN

Lake Wilhelm Dam was designed by the SCS. Design data included in this report were obtained from:

- 1) SCS Drawings No. PA-475-P, "Sandy Creek Watershed, Multiple Purpose Dam PA-475, Crawford and Mercer Counties, Pennsylvania," 48 sheets, designed 1966, "as built" 1969. (Copies of sheets 4, 5, 6, 9, 18, 19, 21 and 48 are included in this report as Plates 3-10; prints of other sheets are available in Pennsylvania Department of Environmental Resources' [PennDER] and SCS's files.)
- 2) Dam Permit Application Report prepared by the Pennsylvania Department of Forests and Waters (predecessor of PennDER) on 3 June 1966.
- 3) "Design Report, Site PA-475, Sandy Creek, Pennsylvania," by the SCS.
- 4) "Sandy Creek Watershed Work Plan," report prepared by Mercer County Commissioners, et al., April 1962.

### 2.2 CONSTRUCTION

Chronological information concerning the construction of Lake Wilhelm Dam was presented in paragraph 1.2.g. The information was obtained from the files of PennDER and the Mercer County Conservation District office. During construction of the dam, the SCS provided full-time inspection. The semi-monthly inspection reports of the construction progress are available in PennDER's files. A representative of the Pennsylvania Department of Forests and Waters (now PennDER) made periodic visits to the dam during construction. Memoranda, and black and white photographs of construction progress are also available in PennDER's files.

### 2.3 OPERATION

Lake Wilhelm is operated at normal pool throughout the year. The maintenance personnel visit the dam daily in order to read the staff gage located on the intake riser assembly. Records of these readings are on file in the park office.



2.4 EVALUATION

- a. Availability - The information reviewed consisted of PennDER's file on the dam and information obtained from the owner's representative.
- b. Adequacy - The information available is adequate for a Phase I Inspection.
- c. Validity - There is no indication at the present time to doubt the validity of the available engineering data.

## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

- a. General - The dam and its appurtenant structures were found to be in good overall condition at the time of the inspection, with the exception of two wet areas in the emergency spillway channel. Noteworthy deficiencies observed are described briefly in the following paragraphs. The complete visual inspection check list and field sketch are given in Appendix A.

- b. Dam - A bare, eroded pedestrian path is present on the downstream face of the dam leading from the parking lot and sanitary station to the crest of the dam. Several smaller ruts and erosion paths were noted on the embankment (see field sketch for locations).

The riprap on the upstream face and around the outlet basin is overgrown with vegetation in several areas.

A marshy area exists in the approach channel of the emergency spillway. The wet zone is on the left side of the channel near the control section. The area at the end of the discharge channel is also wet and marshy.

- c. Appurtenant Structures - The concrete in the intake riser assembly and outlet structure appeared to be in good condition. The cursory survey made at the time of the visual inspection indicates the riser structure has undergone a differential movement of approximately 2.5 inches. Erosion was noted around the outlet head wall and wing walls. On 4 June 1979 during a site visit, a horizontal crack was observed immediately above the outlet conduits.
- d. Reservoir Area - The reservoir slopes are moderately sloping and consist primarily of farmland and second growth forests.
- e. Downstream Channel - The slopes adjacent to the downstream channel are relatively steep and partially wooded. The slope of the downstream channel is mild, averaging approximately 12 feet per mile. The Borough of Sandy Lake is located about 1 mile downstream from the dam. Approximately 40 homes are located in the floodplain area below the dam at the north end of the Borough of Sandy Lake.



## SECTION 4 - OPERATIONAL PROCEDURES

### 4.1 PROCEDURES

There are no formal emergency procedures in the event of an impending catastrophe involving the dam. It is understood that the condition of the dam is checked by Maurice K. Goddard State Park personnel daily in conjunction with the reading of the staff gage located on the intake riser assembly. The spillway and outlet works are uncontrolled. Two 66-inch-square manually operated sluice gates are available for drawdown.

It is recommended that formal emergency procedures be prepared, prominently displayed and furnished to all operating personnel.

### 4.2 MAINTENANCE OF DAM

Although routine upkeep is presently performed by the state park personnel, maintenance of the dam is the responsibility of the Mercer County Commissioners. No records of the routine maintenance are kept.

### 4.3 MAINTENANCE OF OPERATING FACILITIES

The operating equipment is inspected, operated and lubricated twice a year by the state park maintenance personnel.

### 4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning system or procedure in the event of a dam failure. An emergency warning procedure should be developed.

## SECTION 5 - HYDRAULIC/HYDROLOGIC

### 5.1 EVALUATION OF FEATURES

- a. Design Data - Hydrologic and hydraulic design calculations for Lake Wilhelm Dam were obtained from the SCS "Design Report." The dam was designed to reduce floodwater damages and is accordingly capable of providing protection for a 100-year frequency storm. The elevations of the design high water and top of dam were determined by routing the emergency spillway and freeboard hydrographs through the reservoir. Both hydrographs were based on a storm duration of 6 hours. A brief summary of the rainfall and hydrograph data used in the analysis is as follows:

Hydrograph	6-hour Rainfall (inches)	Runoff (inches)	Hydrograph Peak (c.f.s.)
Emergency Spillway	7.81	5.23	25,060
Freeboard	21.25	18.21	108,415

The results of the flood routing analysis are as follows:

Hydrograph	Peak Inflow (c.f.s.)	Maximum Outflow (c.f.s.)	Maximum Reservoir Elevation (feet M.S.L.)
Emergency Spillway	25,060	3,030	1199.8
Freeboard	108,415	11,000	1211.5

- b. Experience Data - The greatest flood of record, since construction of the reservoir, occurred in June 1972. According to the "Post Flood Report for Tropical Storm Agnes" the Lake Wilhelm watershed received an average of 4 inches of rainfall during the period of 20-25 June 1972.
- c. Visual Observations - No condition was observed at the time of the inspection to indicate that the spillway and outlet works could not operate satisfactorily in the event of a flood.

- d. Overtopping Potential - Lake Wilhelm Dam is classified as a "High" hazard-"Large" size dam requiring evaluation for a spillway design flood equal to the Probable Maximum Flood (PMF). Since the dam was designed by the SCS using a spillway design flood developed with the Probable Maximum Precipitation (PMP) [Refer to page 2 of 6, Appendix D], no further hydrologic or hydraulic analysis was performed.
- e. Spillway Adequacy - The dam, as outlined above, was designed based on a freeboard hydrograph which is essentially equal to the PMF. Therefore, the spillway is "adequate" according to the recommended criteria.



## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations - No structural inadequacies were noted during the visual inspection of the dam. The wet and marshy areas indicated in paragraph 3.1.b. are not considered detrimental to the stability of the dam according to the conditions present at the time of inspection. The differential movement of the riser intake assembly does not appear to have an effect on the structural stability at the present time. It is recommended, however, that a monitoring program be established and appropriate remedial actions be taken, if necessary.
- b. Design and Construction Data - The dam was designed and constructed according to standard SCS procedures for structures of this type. According to the SCS "Design Report," the upstream slope of the dam has a safety factor of approximately 2.0 under rapid drawdown conditions and the downstream slope has a safety factor of approximately 1.7 under steady seepage conditions.
- c. Operating Records - Nothing in the readily available operating information would lend itself to questioning the relative structural stability of the embankment.
- d. Post-Construction Changes - There have been no post-construction changes which would adversely affect the structural stability of the dam.
- e. Seismic Stability - The dam is located in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States, "Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams." This is a zone of very low seismic activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions if they have adequate stability under static loading conditions. Therefore, if the monitoring program indicates that the movement of the intake riser (with remedial measures, if necessary) does not effect the static stability of the dam, then further consideration of seismic stability is not necessary.

## SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

### 7.1 DAM ASSESSMENT

- a. Safety - The dam and its appurtenant structures were found to be in good overall condition at the time of inspection. Lake Wilhelm Dam is evaluated as being a "High" hazard-"Large" size dam in accordance with the "Recommended Guidelines for Safety Inspection of Dams" and should have a spillway capacity equal to the PMF. As presented in Section 5, the spillway and reservoir were determined to be of sufficient size to pass PMF. Based on this investigation, the spillway capacity is assessed as "adequate."
- b. Adequacy of Information - The information available and the observations made during the field inspection are considered sufficient for this Phase I Inspection Report.
- c. Urgency - The owner should initiate without delay the recommendations discussed in paragraph 7.1.d.
- d. Necessity for Additional Data/Evaluation - The visual inspection indicated the existence of two marshy areas in the emergency spillway channel. The area in the approach channel is believed to be the result of natural springs; however, the cause of the marshy area in the exit channel could not be determined. It is therefore recommended that a monitoring program for the marshy areas be established to determine if quantity or quality changes take place and to institute appropriate action, if necessary.

Review of a survey and inspection report dated 23 November 1976 indicated that a slight uplift of the riser had occurred along with some settlement of the principal spillway. During our visual inspection on 19 April 1979, a cursory survey of the embankment and appurtenances was made and our findings also indicated some differential movement of the riser structure. According to the personnel at the Mercer County SCS office, as part of their annual late fall inspection routine, the water in the lake is lowered and the inside of the outlet conduit is examined. The movement of the riser could cause a break in the outlet conduit and thereby create an uncontrolled discharge from the

dam. It is therefore recommended that the owner initiate a program whereby the movement of the riser could be monitored more closely in order to avert any major problems.

## 7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection and review of information revealed certain items of work which should be performed without delay by the owner. These include:

- 1) The owner should initiate a monitoring program for the marshy areas to determine if quantity or quality changes take place and to institute appropriate action, if necessary. If the cause of both areas is the result of natural springs, the installation of spring drains is recommended.
- 2) The owner should initiate a program whereby the movement of the riser could be monitored and appropriate remedial measures taken, if required.

In order to correct operational, maintenance and repair deficiencies, the following measures are recommended to be undertaken by the owner in a timely manner:

- 1) The eroded areas should be graded, treated and seeded with an appropriate seeding mixture to prevent erosion.
- 2) A permanent walkway should be installed or necessary repairs made on the downstream face leading from the parking lot to the crest of the dam. A permanent walkway would eliminate the damage to the embankment caused by the heavy pedestrian traffic in this area.
- 3) The overgrowth of vegetation should be removed from the riprap.
- 4) The crack in the head wall above the outlet conduits should be repaired.

The owner should continue in the future to inspect the embankment and concrete appurtenances, and repair as necessary.



In addition, the following operational measures are recommended to be undertaken by the owner:

- 1) Develop a detailed emergency operation and warning system.
- 2) During periods of unusually heavy rain provide around-the-clock surveillance of the dam.
- 3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

PLATES



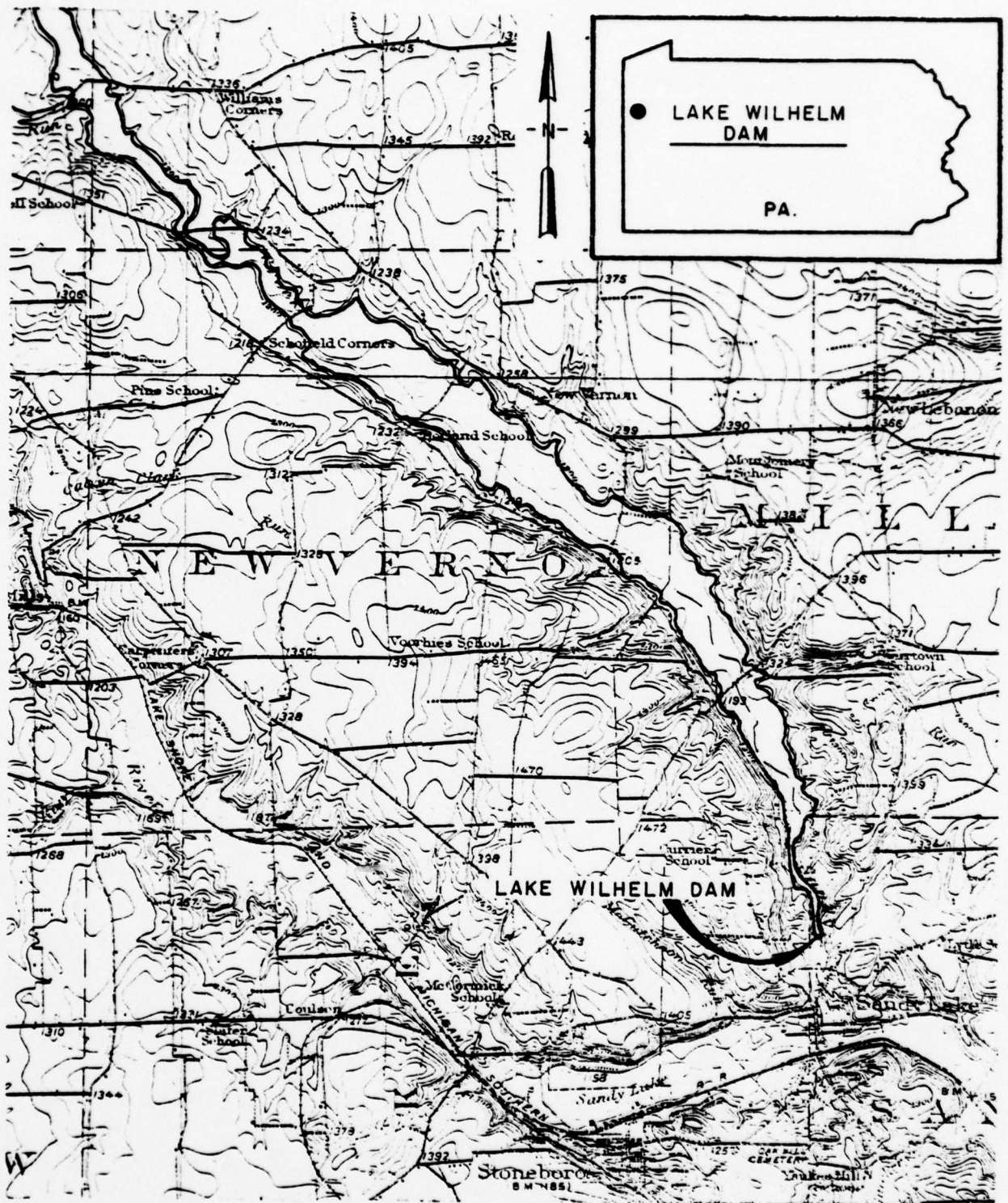


PLATE I LOCATION PLAN  
LAKE WILHELM DAM

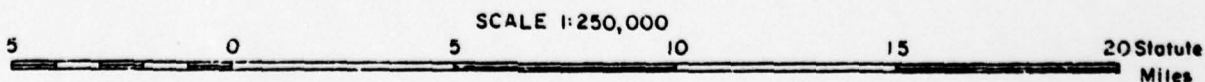
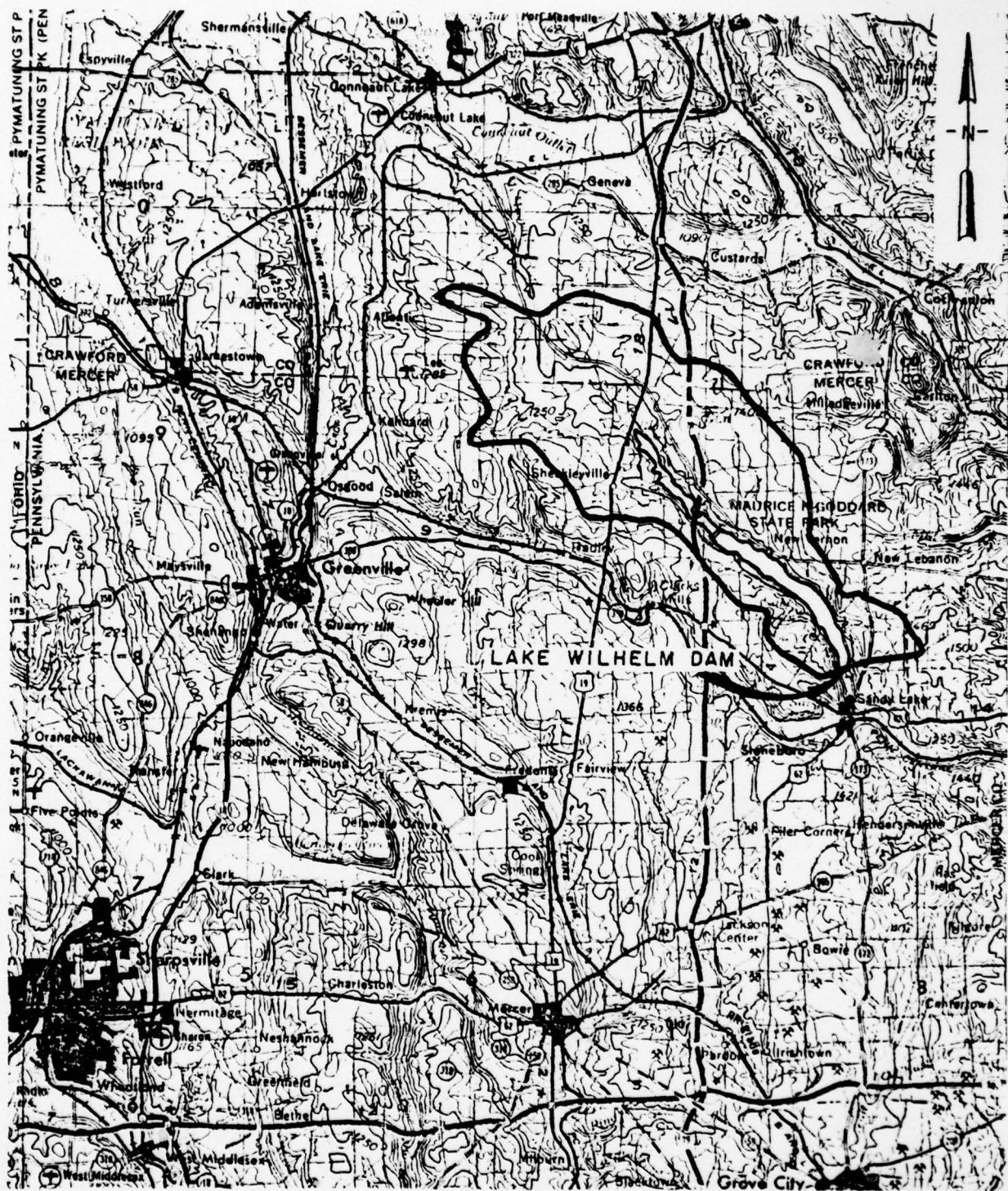
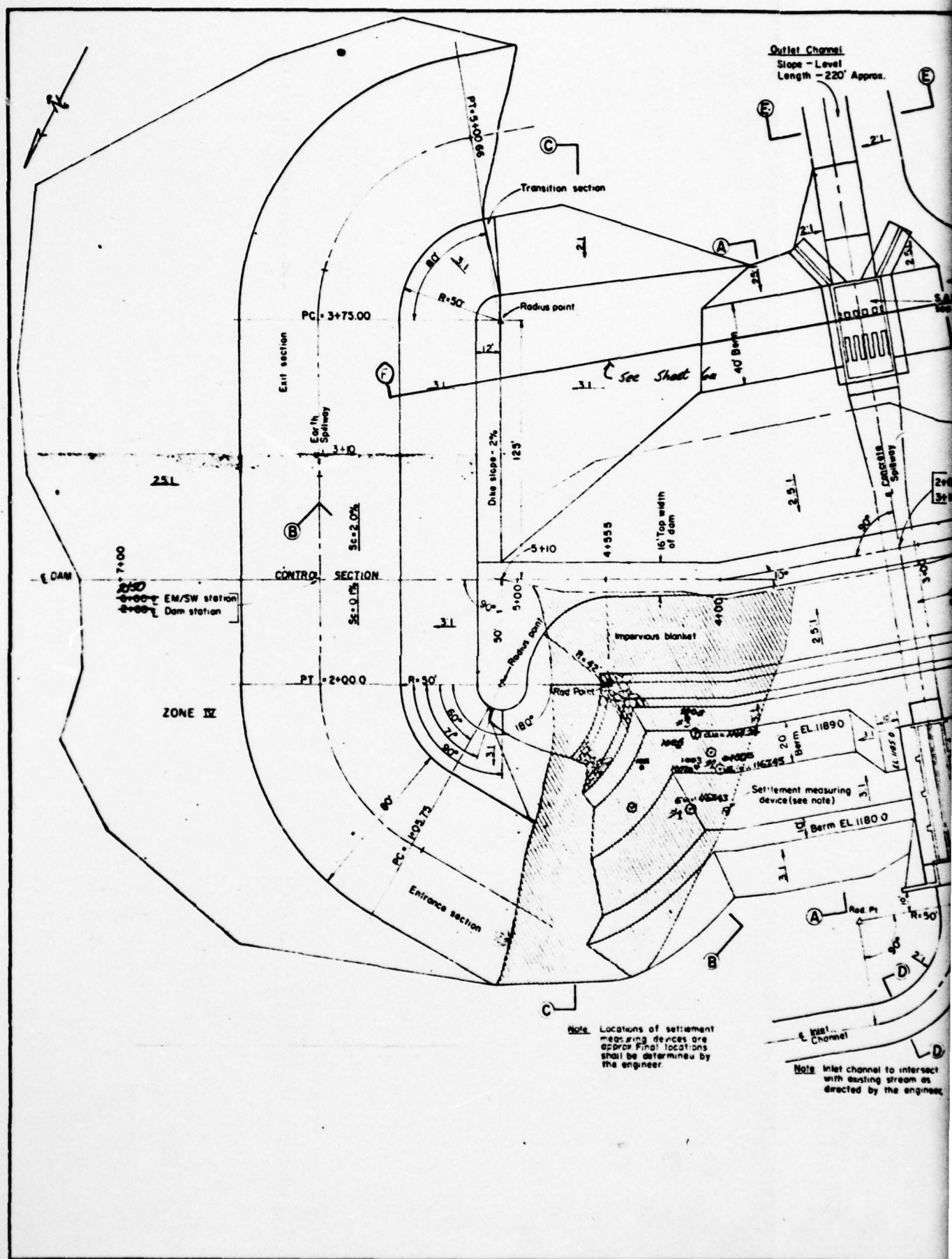


PLATE 2 WATERSHED MAP  
LAKE WILHELM DAM





Level  
= 220' Approx.

**CURVE DATA**

T = 51.96'  
C = 90.00'  
L = 94.25'  
M = 12.05'  
E = 13.95'  
PC = 1+08.75  
PT = 2+03.00  
I = 60°  
R = 90'

STATION	DEFLECTION	CHORD LENGTH
PC 1+08.75	0°-00'	9.42
1+15.18	3°-00'	9.42
1+24.60	6°-00'	9.42
1+34.05	9°-00'	9.42
1+43.48	12°-00'	9.42
1+52.88	15°-00'	9.42
1+62.30	18°-00'	9.42
1+71.73	21°-00'	9.42
1+81.15	24°-00'	9.42
1+90.58	27°-00'	9.42
PT 2+03.00	30°-00'	9.42

**UPSTREAM CURVE**

EARTH SPILLWAY & CURVE DATA

**CURVE DATA**

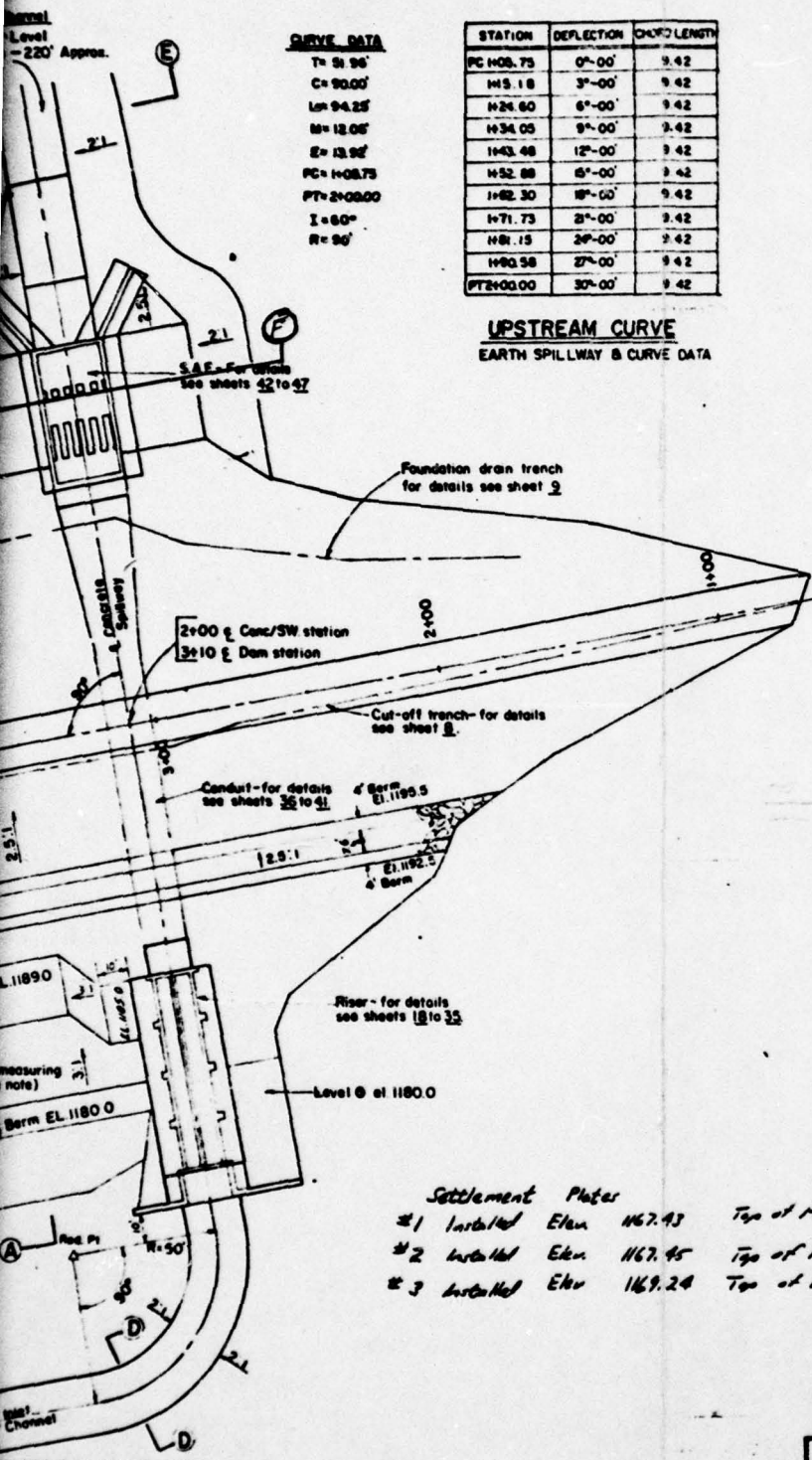
T = 75.52'  
C = 115.70'  
L = 125.86'  
M = 11.06'  
E = 37.48'  
PC = 3+75.00  
PT = 5+00.86  
I = 80°  
R = 90'

STATION	DEFLECTION	CHORD LENGTH
PC 3+75.00	0°-00'	12.56
3+87.57	4°-00'	12.56
4+00.13	8°-00'	12.56
4+12.70	12°-00'	12.56
4+25.26	16°-00'	12.56
4+37.83	20°-00'	12.56
4+50.40	24°-00'	12.56
4+62.96	28°-00'	12.56
4+75.53	32°-00'	12.56
4+88.09	36°-00'	12.56
PTS+UL 5+00.86	40°-00'	12.56

**DOWNSIDE CURVE**

EARTH SPILLWAY & CURVE DATA

THIS PAGE IS BEST QUALITY REPRODUCTION  
FROM COPY FURNISHED TO DDC



Settlement	Plates		
#1	Installed	Elev	167.43
#2	Installed	Elev	167.45
#3	Installed	Elev	169.24

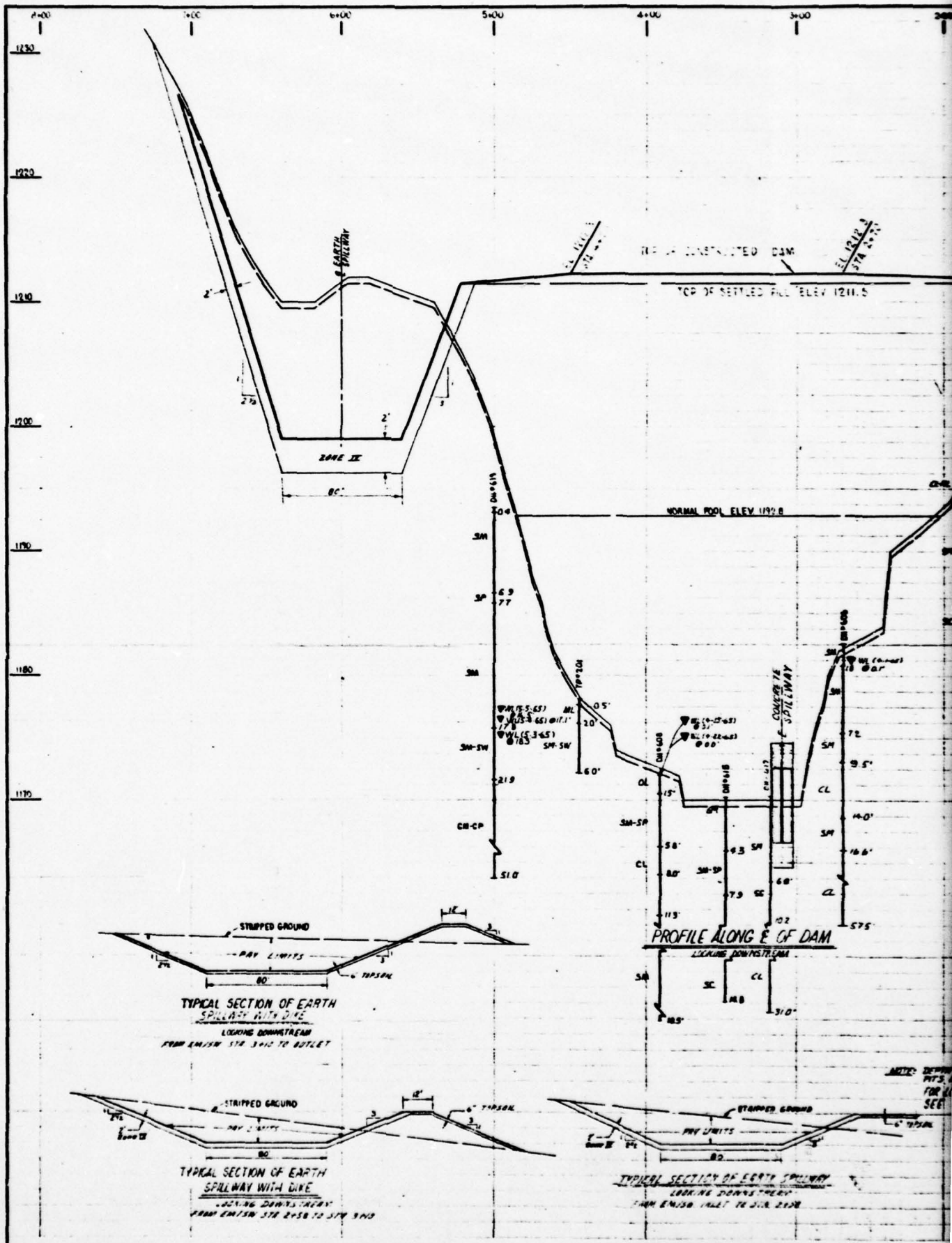
**AS BUILT PLANS**



© Hor. & Vert. locations: Settling Device Plates  
• Test Drill Hole locations

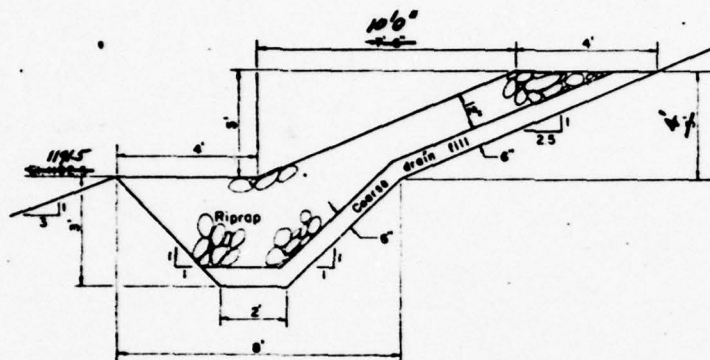
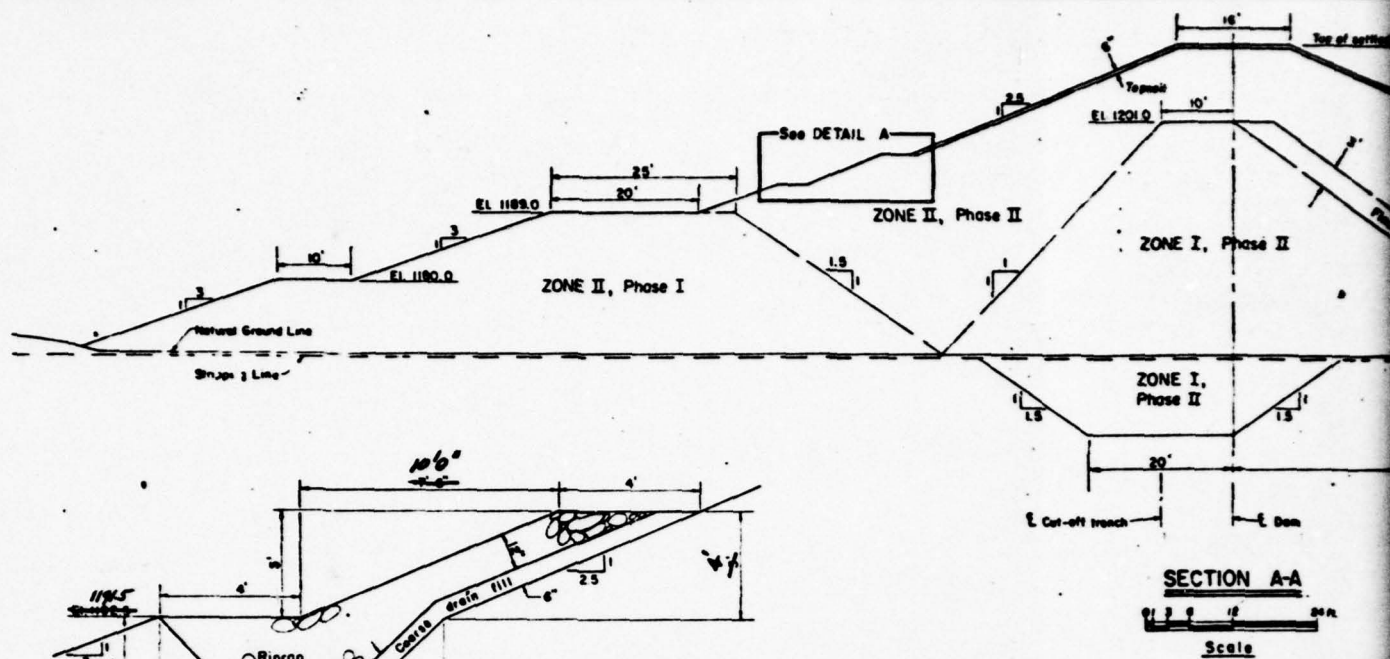
**PLATE 3**

<b>SANDY CREEK WATERSHED PROJECT</b>			
MULTIPLE PURPOSE DAM PA-475			
CRAWFORD & MERCER COUNTIES, PENNSYLVANIA			
<b>PLAN OF STRUCTURAL WORKS</b>			
<b>U. S. DEPARTMENT OF AGRICULTURE</b>			
<b>SOIL CONSERVATION SERVICE</b>			
Designed by	M. Riddlesberger	Date	Mar '66
Drawn by	R. A. Stalter	Date	Oct '66
Traced by	D. L. Fleig	Date	Feb '67
Checked by	F. Foreman	Date	FEB 67
Approved by		Date	
			PA-475-P

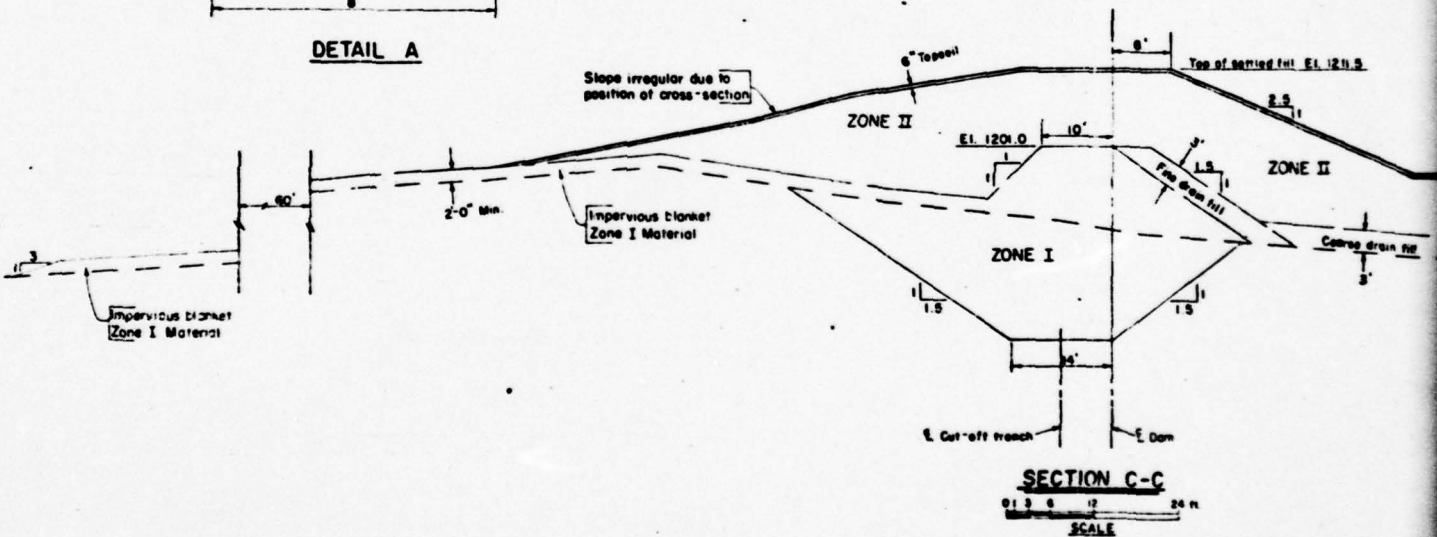








DETAIL A



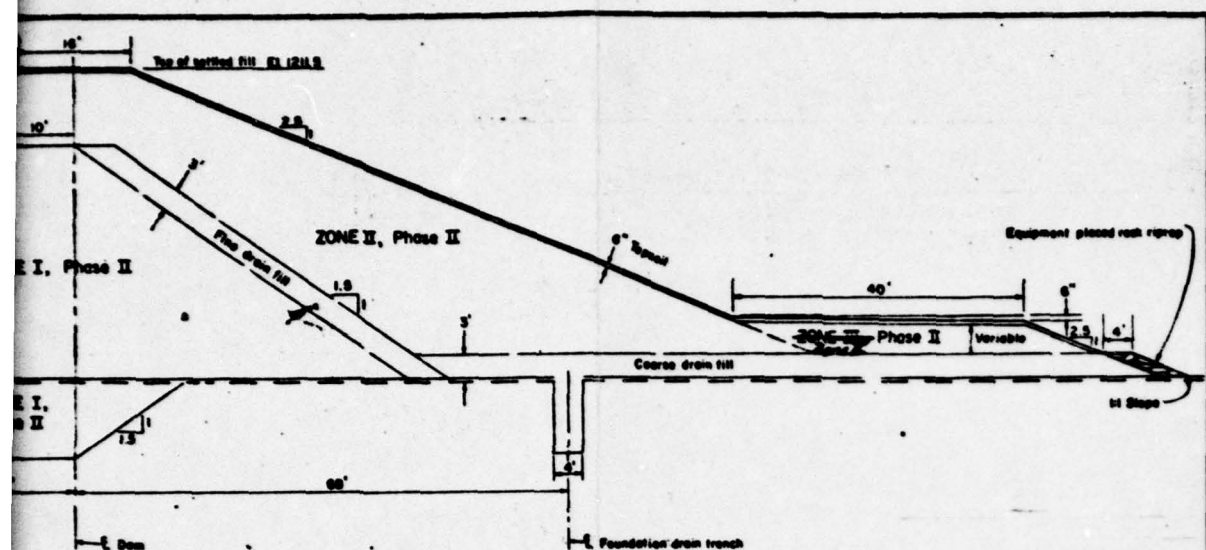
# EARTH FILL REQUIREMENTS

Zone	Material	Max Rock Size	Max Lift	Reqd Water Content	Compaction
I 16,644 cu yd	Silty clayey sand (SC-SM), represented by TP-103 from 1 to 5, and TP-102 from 6 to 8	6"	9"	-1% to +2% optimum	A
II 41,419 cu yd	Gravel (GP-GM), represented by TP-202 from 1 to 10, TP-102 from 0.6 to 6.0, TP-104 from 4.5 to 8.5	6"	9"	optimum to +3%	A
III	Over-sized rock rods from other zones	18"	18"	Any	X
IV	Silty clayey sand (SC-SM), represented by TP-103 from 1 to 5	6"	9"	-1% to +2% optimum	S

- 1/ Max. lift thickness prior to compaction.  
2/ Water content at time of placement.

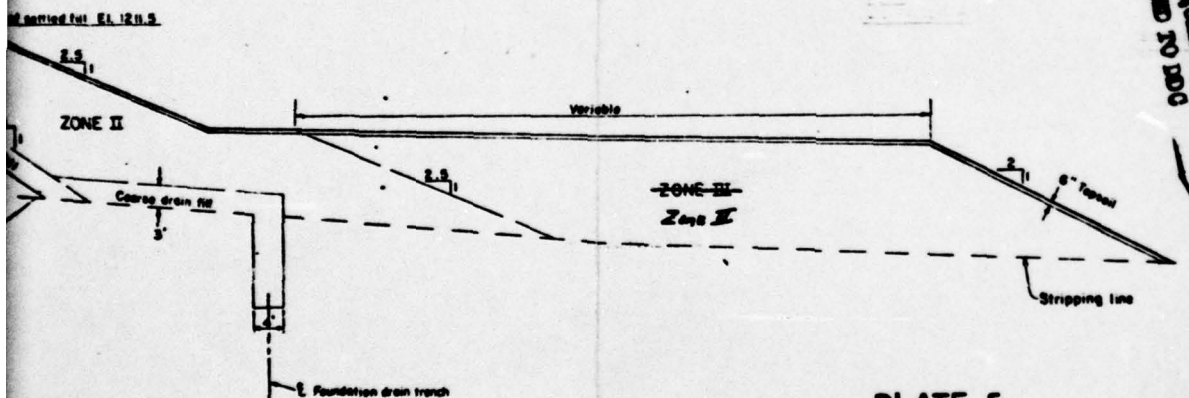
## NOTES

- The foundation surface throughout the base area of the dam shall be scarified to a depth of 6" and compacted prior to placement of material, except under drain fill.
- Along the cut-off trench and under the impervious blanket, where Zone I material is shown on the plans, drain fill or Zone II material will be required at selected places against the natural soil, as determined by the engineer.



Note: for change in Zoning see sheet 6a.

SECTION A-A  
Scale



## PLATE 5

### CONSTRUCTION SEQUENCE

#### Phase One

- Concrete spillway.
- Phase I part of fill.

#### Phase Two

- Completion of fill.
- Remainder of construction required.

## AS BUILT PLANS

SANDY CREEK WATERSHED PROJECT  
MULTIPLE-PURPOSE DAM PA 475

CRAWFORD & MERCER COUNTIES, PENNSYLVANIA

EMBANKMENT ZONING REQUIREMENTS

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed by J M RIDGEBERGER	Date 5-66	Approved by [Signature]
Drawn by C CRISE	Date 9-66	Checked by [Signature]
Traced by F FORMAN	Date 1-67	Sheet No. 6 of 6
Project No. PA-475 - P		Drawing No. PA-475 - P

U.S. 111B (APRIL 1963)

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Surface throughout the base shall be scarified to a depth of 6 inches prior to placement of fill under drain fill. Off trench and under the impervious Zone I material is shown on the plan. Zone II material will be required against the natural soil, as shown on the plan.

2



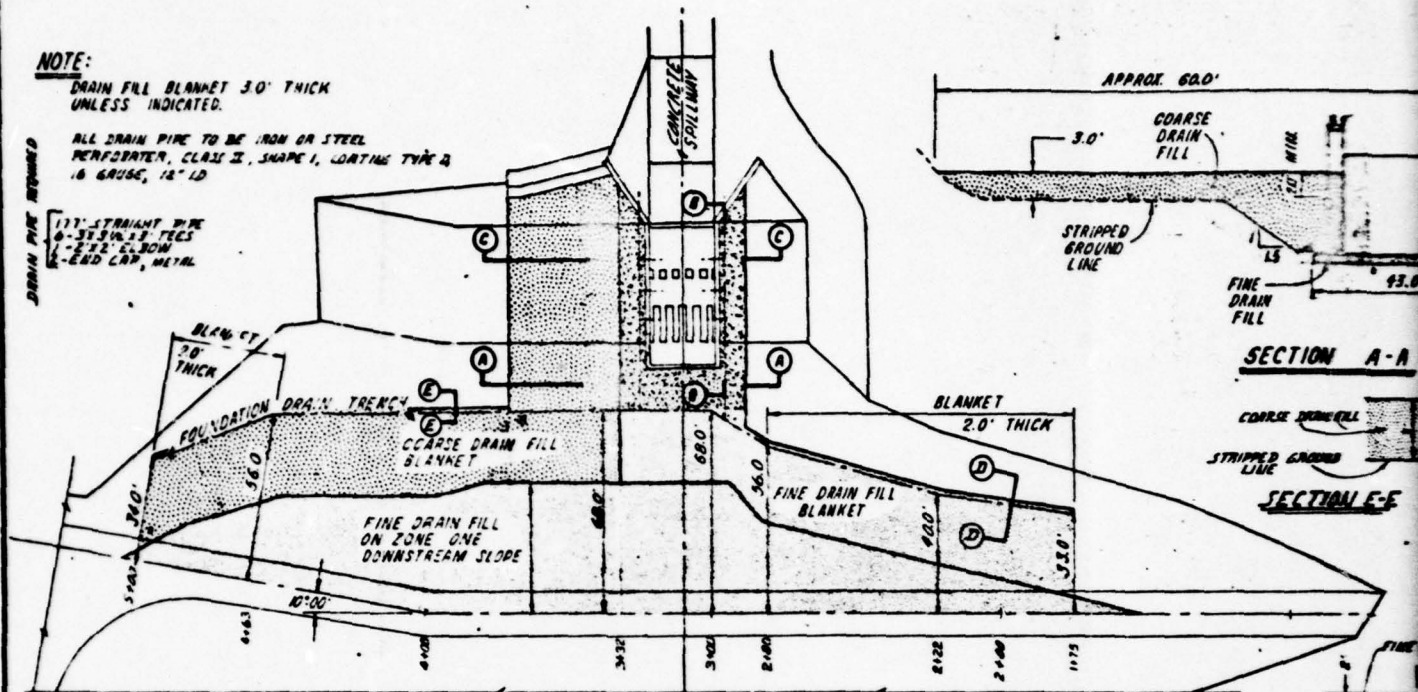
# NOTE:

DRAIN FILL BLANKET 3.0' THICK  
UNLESS INDICATED.

ALL DRAIN PIPE TO BE IRON OR STEEL  
PERFORATED, CLASS II, SHAPE 1, LACING TYPE 2  
1/8 GAUGE, 1/2" ID

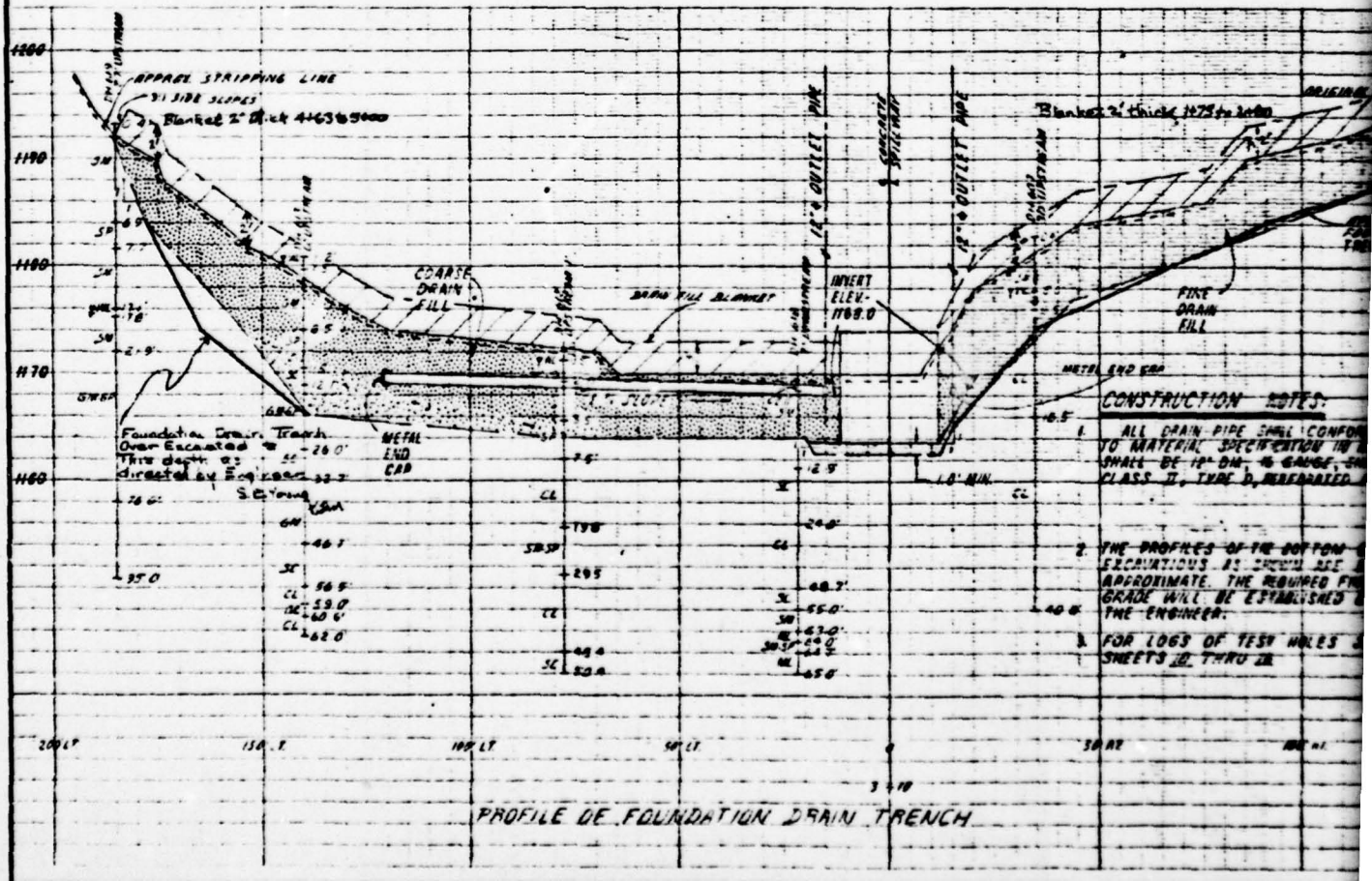
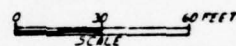
DRAIN PIPE REQUIRED

1 1/2" STRAIGHT PIPE  
8-30 IN. 2.5' TIES  
2 1/2" CL. 10 IN  
1" END CAP, METAL

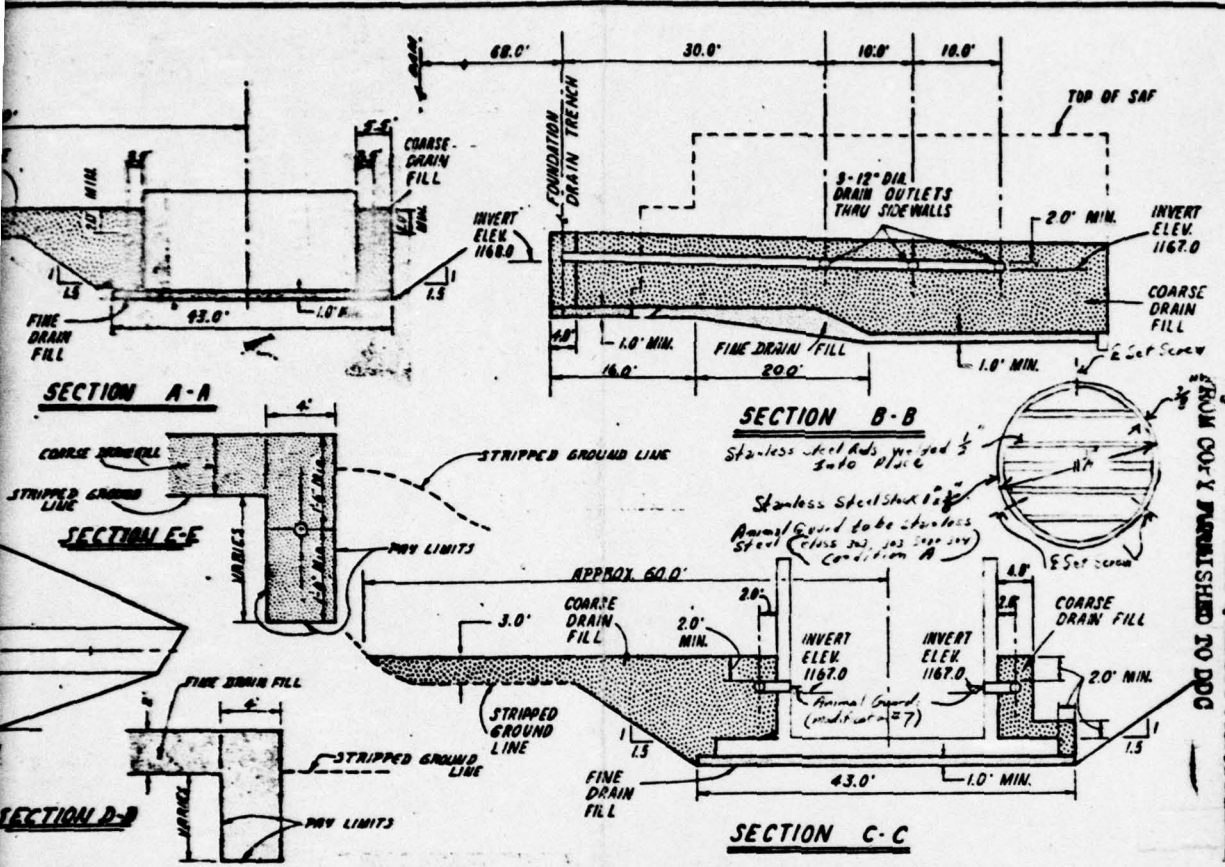


NOTE: ALONG THE DRAIN TRENCH AND UNDER THE BLANKET WHERE  
COARSE MATERIAL IS SHOWN IN THE PLANS, FINE DRAIN  
MATERIAL WILL BE REQUIRED AT SELECTED PLACES AGAINST  
THE NATURAL SOIL, AS DETERMINED BY THE ENGINEER.

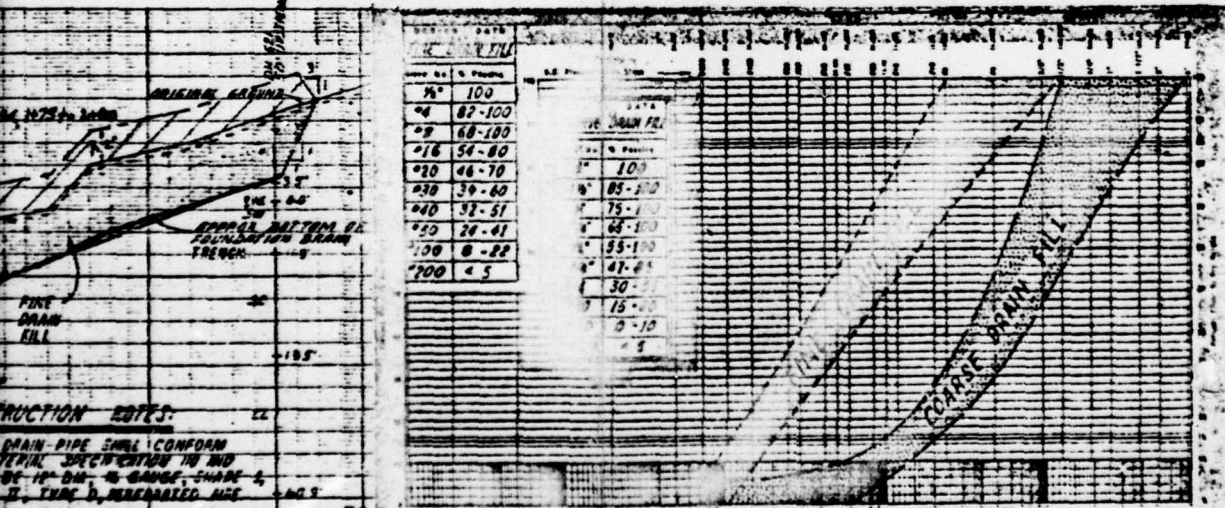
## PLAN VIEW



## PROFILE OF FOUNDATION DRAIN TRENCH



THIS PAGE IS SUPPLEMENTARY TO DRAWING NO. 60-X FURNISHED TO DDC



**INSTRUCTION NOTES:**

DRAIN PIPE SHALL CONFORM  
 MATERIAL SPECIFICATION IN AND  
 BE 12" DIA. 45 GALLON SHAPE &  
 IT, TYPE D, REBARKED AGE

PROFILES OF THE BOTTOM OF ALL  
 TRENCHES AS SHOWN ARE ONLY  
 APPROXIMATE. THE REQUIRED FINISHED  
 BOTTOM WILL BE ESTABLISHED BY  
 THE ENGINEER.

TOP OF 12" DIA. HOLE SEE  
 DRAWING NO. 60-X

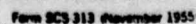
## PLATE 6 AS BUILT PLANS

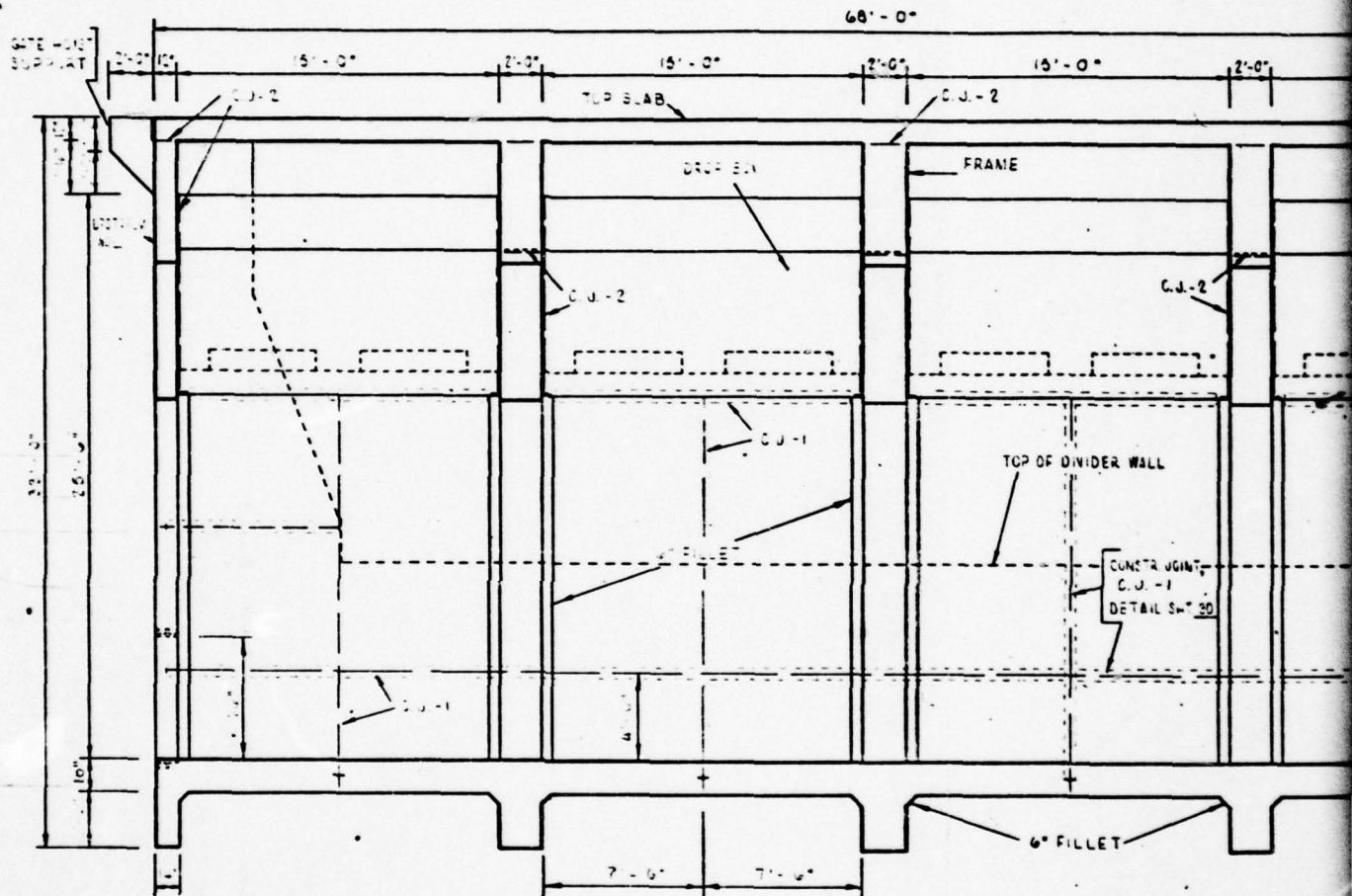
<b>SANDY CREEK WATERSHED</b> MULTIPLE PURPOSE DAM PA-475 CRAWFORD & MERCER COUNTIES PENNSYLVANIA <b>DRAINAGE DETAILS</b>			
<b>U.S. DEPARTMENT OF AGRICULTURE</b> <b>SOIL CONSERVATION SERVICE</b>			
Date 1964 Drawn by C. CRUSE T. WILLIAMS Project 5-46	Date 1964 Drawn by 5-46	Date 1964 Drawn by 5-46	Date 1964 Drawn by 5-46
Checked by R. PATTERSON		Date 1-67	
Project No. <b>PA-475-P</b>			



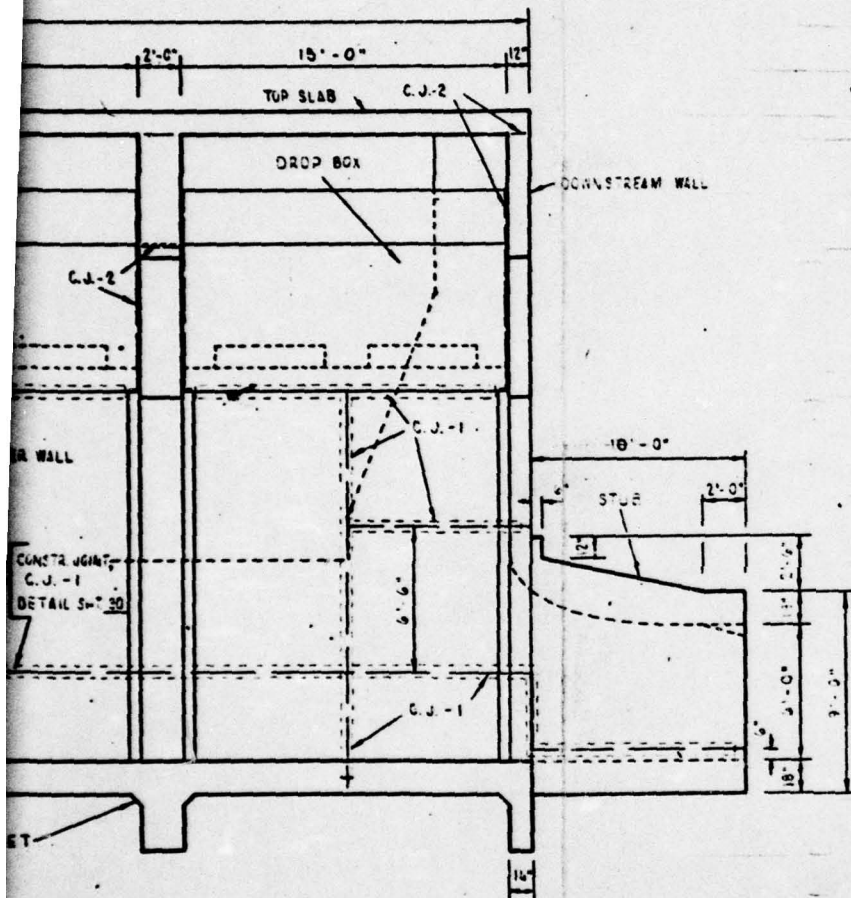








SIDE ELEVATION



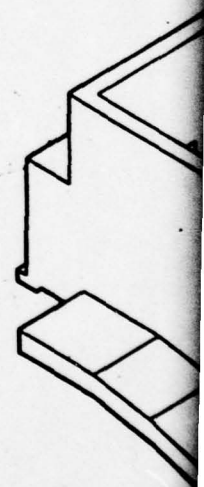
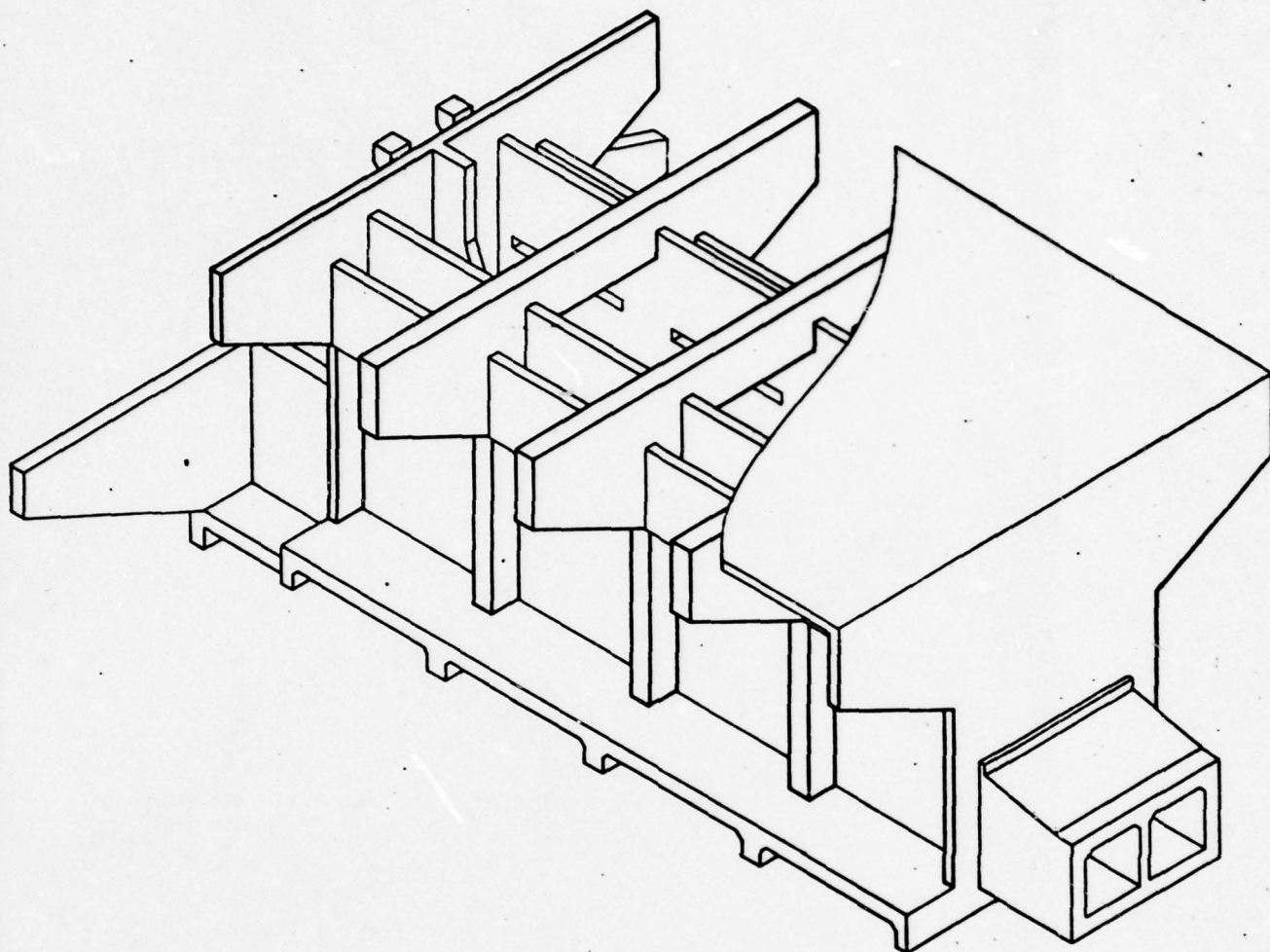
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FROM COPY FURNISHED TO DDC

## PLATE 8 AS BUILT PLANS

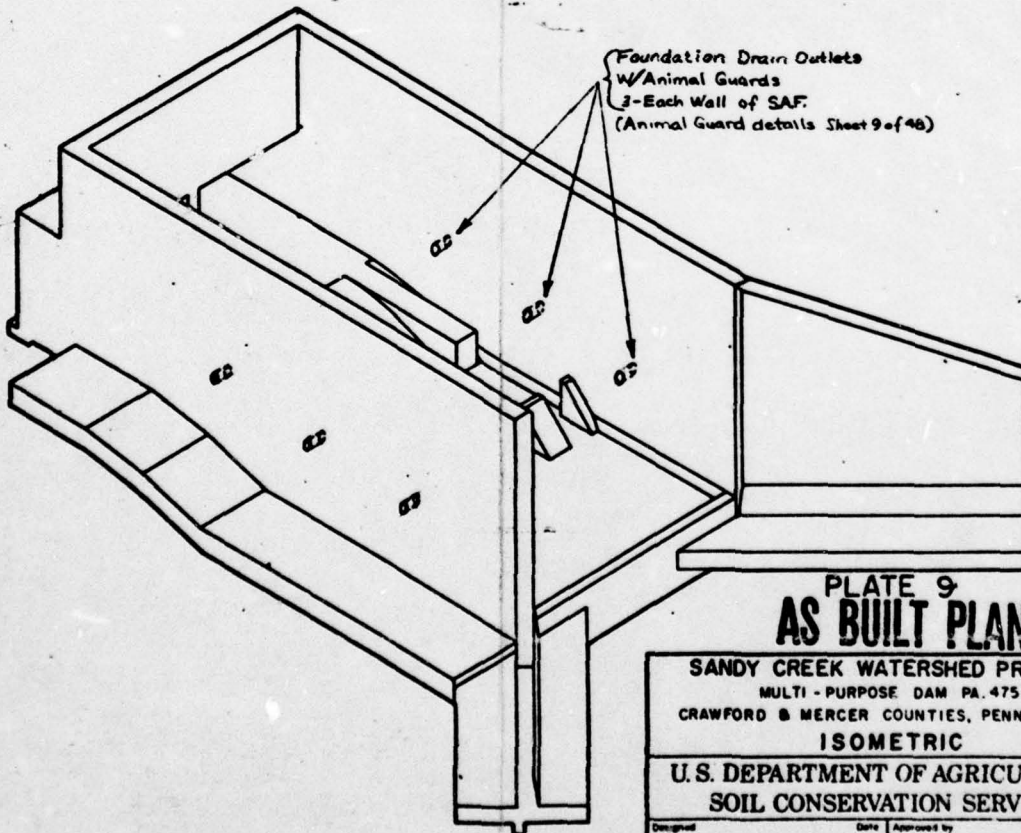
0 1 2 3 4 5 6 FEET  
SCALE

SANDY CREEK WATERSHED PROJECT			
MULTIPLE - PURPOSE DAM PA 475			
CRAWFORD & MERCER COUNTIES, PENNSYLVANIA			
RISER DETAILS			
U.S. DEPARTMENT OF AGRICULTURE			
SOIL CONSERVATION SERVICE			
Designed FD THEURER	Date MAY '66	Reviewed By H. T. BROWNING JR.	Scale 1"=10'
Drawn H. T. BROWNING JR.	Checked E. P. JENNIS	Project No. PA-475-P	Sheet No. 19





Foundation Drain Outlets  
w/Animal Guards  
3-Each Wall of SAF  
(Animal Guard details Sheet 9 of 48)



# PLATE 9 AS BUILT PLANS

SANDY CREEK WATERSHED PROJECT  
MULTI - PURPOSE DAM PA. 475  
CRAWFORD & MERCER COUNTIES, PENNSYLVANIA  
ISOMETRIC

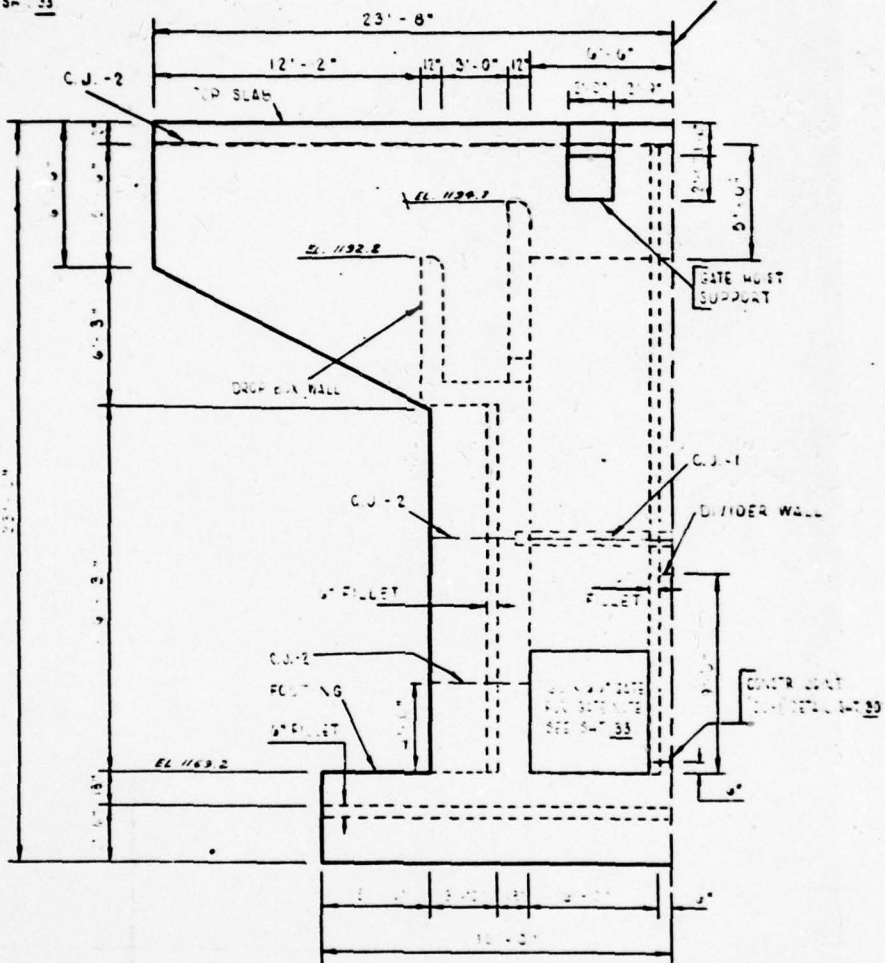
U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed F.D. THEURER	Date MAY '66	Approved by Title
Drawn <i>Mr. Tubbs</i>		Title
Checked <i>Fred D. Theurer</i>	Sheet No. 48 of 48	Drawing No. PA - 475 - P

TRASH RACK  
DETAIL 54" 33

SYMMETRICAL  
ABOUT  $\frac{1}{2}$

SYMMETRICAL  
ABOUT  $\frac{1}{2}$



ALTERNATE SECTION





APPENDIX A

CHECK LIST - VISUAL INSPECTION  
AND FIELD SKETCH

Check List  
Visual Inspection  
Phase 1

A-1

Name of Dam Lake Wilhelm Dam County Mercer State PA Coordinates Lat. N 41° 22.2'

NDI # PA 00900  
PENNER # 43-53  
SCS # PA 475

Long. W 80° 05.2'

Date of Inspection 19 April 1979 Weather Sunny, Windy Temperature 50°F.

Pool Elevation at Time of Inspection 1192.80 ft. M.S.L.\* Tailwater at Time of Inspection 1172.20 ft. M.S.L.\*

\*Elevations are based on the top of the concrete head wall of the outlet structure  
81.80 ft. M.S.L. according to information contained in "as built" plans from SCS.

Inspection Personnel:

Michael Baker, Jr., Inc.:

Rodney E. Holderbaum  
James G. Ulinski  
David Johns

Site Visit on 4 June 1979

Dr. C. Y. Chen  
James G. Ulinski

Owner's Representatives:

Ward Guellich - Maint. Repair I

David Johns Recorder



CONCRETE/MASONRY DAMS - Not Applicable

A-2

Name of Dam: LAKE WILHELM DAM

NDI # PA 00900

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

LEAKAGE

STRUCTURE TO  
ABUTMENT/EMBANKMENT  
JUNCTIONS

DRAINS

WATER PASSAGES

FOUNDATION

CONCRETE/MASONRY DAMS - Not Applicable

A-3

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

SURFACE CRACKS  
CONCRETE SURFACES

STRUCTURAL CRACKING

VERTICAL AND HORIZONTAL  
ALIGNMENT

MONOLITH JOINTS

CONSTRUCTION JOINTS

**EMBANKMENT**

**A-4**

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

**VISUAL EXAMINATION OF** **OBSERVATIONS** **REMARKS OR RECOMMENDATIONS**

**SURFACE CRACKS** No surface cracks were observed. The embankment is well vegetated with grasses and crown vetch.

**UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE** No unusual movement was observed.

**SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES**

1. A bare, eroded pedestrian path is present on the downstream face leading from the parking lot and sanitary station to the crest of the dam.
1. Recommend installation of permanent walkway to prevent further reoccurrence.
2. Several ruts and small erosion paths were noted on the crest and upstream face.
2. The ruts and erosion paths should be regraded, treated and seeded with an appropriate mixture to prevent erosion.
3. Erosion was observed around the stilling basin.
3. Recommend that the area be regraded, treated and seeded to prevent erosion. If the problem reoccurs, then riprap should be placed.

**VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST** No misalignment was noted.

**RIPRAP FAILURES** The riprap on the upstream face and around the outlet basin is overgrown with vegetation in several areas. Recommend removal of the overgrowth from riprapped areas.



# EMBANKMENT

A-5

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems were noted.	
ANY NOTICEABLE SEEPAGE	A wet area was noted at the front end of the emergency spillway. The outlet area of the emergency spillway is wet and marshy.	A monitoring program for both marshy areas should be established to determine any changes in quantity or quality and to institute appropriate action if necessary.
STAFF GAGE AND RECORDER	A staff gage is located on the side of the riser inlet structure.	
DRAINS	Embankment drains were installed; however, due to the height of the tailwater, no assessment could be made.	

JUNCTION OF EMBANKMENT  
AND ABUTMENT, SPILLWAY  
AND DAM

No problems were noted.

ANY NOTICEABLE  
SEEPAGE

A wet area was noted at the front end of the emergency spillway.

The outlet area of the emergency spillway is wet and marshy.

A monitoring program for both marshy areas should be established to determine any changes in quantity or quality and to institute appropriate action if necessary.

STAFF GAGE AND RECORDER

A staff gage is located on the side of the riser inlet structure.

DRAINS

Embankment drains were installed; however, due to the height of the tailwater, no assessment could be made.

# OUTLET WORKS

A-6

Name of Dam: LAKE WILHELM DAM

NDI # PA 00900

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The concrete appeared to be in very good condition.	
INTAKE STRUCTURE	The riser inlet structure is in good condition. The only problem noted was the differential movement of approximately 2.5 inches.	A monitoring program should be established and remedial measures taken if required.
OUTLET STRUCTURE	The outlet structure is in good condition; no problems were noted.  However, during a site visit on 4 June 1979, the tailwater was lower than during the visual inspection and a horizontal crack was observed above the outlet conduits.	The crack on the head wall should be repaired.
OUTLET CHANNEL	The outlet channel is protected with riprap on the right side for approximately 50 ft. downstream. No problems were noted.	
EMERGENCY GATE	Two 66-in.-square sluice gates were installed in the riser inlet structure. These gates were inaccessible.	These gates are partially opened periodically.

UNGATED SPILLWAY  
(Emergency Spillway)

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTION	The emergency spillway is a vegetated earth side channel. No erosion or other problems were observed at the control section.	
APPROACH CHANNEL	The approach channel is well vegetated with grasses and crown vetch. A wet area was observed on the left side of the channel near the control section.	
DISCHARGE CHANNEL	The well vegetated discharge channel exits into Sandy Creek a short distance below the dam. The area at the end of the discharge channel was wet and marshy at the time of inspection.	
BRIDGE AND PIERS	None	



GATED SPILLWAY - Not Applicable

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		

A-9

INSTRUMENTATION - None installed

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS		
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER		

RESERVOIR

A-10

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

VISUAL EXAMINATION OF		REMARKS OR RECOMMENDATIONS	
OBSERVATIONS			
SLOPES		The reservoir slopes are stable from soil mechanics and hydraulics (erosion) standpoints.	

The reservoir slopes are moderately sloping and consist primarily of farmland and forests.

SEDIMENTATION

No sedimentation problems were noted.

The reservoir was designed by the SCS with allowance for 100 years of sediment accumulation.

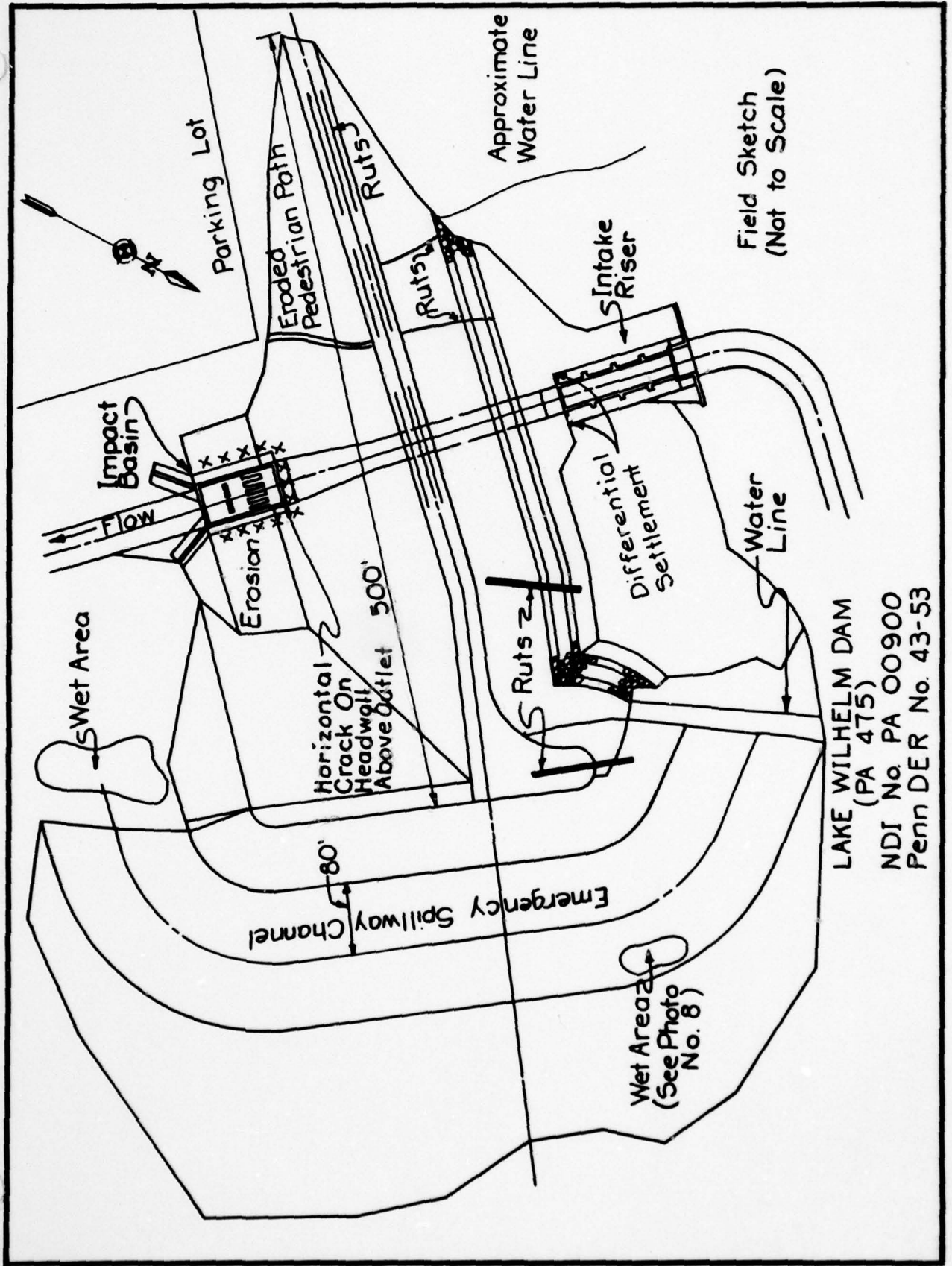


A-11

DOWNSTREAM CHANNEL

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel is free of debris and other obstructions. A few small bridges are located downstream, but do not appear to present any problems.	
SLOPES	The slopes adjacent to the downstream channel are relatively steep and partially wooded. The slope of the downstream channel is mild, averaging approximately 12 ft. per mi.	
APPROXIMATE NO. OF HOMES AND POPULATION	The Borough of Sandy Lake is located approximately 1 mi. downstream from the dam. The population of Sandy Lake (1970 Census) was 772 persons. An estimated 40 homes are located on the north side of Sandy Lake in the immediate floodplain below the dam.	



Field Sketch  
(Not to Scale)

LAKE WILHELM DAM  
(PA 475)  
NDI No. PA 00900  
Penn DER No. 43-53

APPENDIX B

CHECK LIST - ENGINEERING DATA



**CHECK LIST**  
**ENGINEERING DATA**  
**DESIGN, CONSTRUCTION, OPERATION**

Name of Dam: LAKE WILHELM DAM  
 NDI # PA 00900

<u>ITEM</u>	<u>REMARKS</u>
-------------	----------------

PLAN OF DAM See Plate 3 - Plan of Dam.

REGIONAL VICINITY MAP See Plate 1, a portion of a USGS 15 minute Stoneboro, PA quadrangle map showing the dam location with state location inset.

CONSTRUCTION HISTORY Construction of the dam started on 21 August 1967 and finished on 31 October 1969. The work was done by Brodhead Construction Co. The construction was shut down upon occasion for bad weather and also for 6 months to allow the embankment to consolidate.

TYPICAL SECTIONS OF DAM See Plates 4 and 5.

HYDROLOGIC/HYDRAULIC DATA Design computations are included in the SCS "Design Report" and summarized in Appendix D of this report.

OUTLETS - PLAN See Plate 7.

- DETAILS  
and

CONSTRAINTS See Plates 8 and 10.

- DISCHARGE RATINGS are included in the SCS "Design Report" and Appendix D of this report.

RAINFALL/RESERVOIR RECORDS None available

Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

B-2

ITEM	REMARKS
------	---------

DESIGN REPORTS	The SCS report, "Sandy Creek, Site PA - 475," was available through PennDER.
----------------	--

GEOLOGY REPORTS	See Appendix E, also "Design Report" from SCS - available through PennDER.
-----------------	--

DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Design computations were done by the SCS for hydrology and hydraulics. Seepage and stability studies were also done by the SCS.
---	---

MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	A foundation and borrow investigation was performed with test pits and test borings; the computations are contained in the SCS "Design Report."  Boring records are contained as Sheets 3 and 11-17 of the design drawings.
---	---

POST-CONSTRUCTION SURVEYS OF DAM	Due to the slight movement of the riser intake structure, a survey was done on 16 November 1976 by SCS engineers. The results are contained in the PennDER file No. 43-53.
----------------------------------	--

BORROW SOURCES	The majority of the borrow material necessary for the embankment was available from the emergency spillway excavation. These materials are largely the silty sands and gravels used for the shell material and for the impermeable core.
----------------	--

Name of Dam: LAKE WILHELM DAM

NDI # PA 00900

B-3

ITEM

REMARKS

MONITORING SYSTEMS A staff gage is located on the riser intake structure.

MODIFICATIONS None

HIGH POOL RECORDS A high water mark is located on the riser intake structure, El. 1193.70 ft. The daily staff gage readings are taken and the log is available at the park office.

POST-CONSTRUCTION ENGINEERING  
STUDIES AND REPORTS

Annual inspections have been made from 1971 to 1976 by representatives of the Mercer County SCS office and the State Park Superintendent's office. Copies of these inspections are available in the PenndER files.

PRIOR ACCIDENTS OR FAILURE OF DAM  
DESCRIPTION  
REPORTS

None

MAINTENANCE  
OPERATION  
RECORDS

Park personnel visit the riser inlet structure daily to read the staff gage. The log is available at the Maurice Goddard State Park office. Records of routine maintenance are not kept by the park personnel.



Name of Dam: LAKE WILHELM DAM  
NDI # PA 00900

B-4

ITEM	REMARKS
SPILLWAY PLAN	See Plate 3.
SECTIONS	See Plate 4.
DETAILS	See Plates 8 and 10.

**OPERATING EQUIPMENT  
PLANS & DETAILS**

The 66-in.-square manually operated sluice gates are located in the riser intake structure; no detailed drawings are available; photographs of sluice gates installed are available in PennDER file No. 43-53.

CHECK LIST  
HYDROLOGIC AND HYDRAULIC DATA  
ENGINEERING DATA

B-5

DRAINAGE AREA CHARACTERISTICS: 56.5 sq.mi. (predominately wooded)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1192.2 ft. (17,700 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1199.0 ft. (31,250 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 1199.80 ft. (Design High Water)

ELEVATION TOP DAM: 1212.0 ft. (minimum elevation), 1212.2 ft. (average elevation)

CREST: Emergency Spillway

a. Elevation 1199.0 ft.

b. Type Vegetated side channel

c. Width 80 ft.

d. Length Approximately 500 ft.

e. Location Spillover Left abutment area of dam

f. Number and Type of Gates None

OUTLET WORKS: Conduit Spillway

a. Type Twin 6-ft.-square reinforced concrete conduits

b. Location Approximately 210 ft. from left end of embankment

c. Entrance inverts El. 1192.2 ft.

d. Exit inverts El. 1162.80 ft.

e. Emergency draindown facilities Two 66-in.-square sluice gates

HYDROMETEOROLOGICAL GAGES: Not Applicable

a. Type \_\_\_\_\_

b. Location \_\_\_\_\_

c. Records \_\_\_\_\_

MAXIMUM NON-DAMAGING DISCHARGE Unknown

O

**APPENDIX C**

**PHOTOGRAPHS**

O



## DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View of Dam - View from Left Abutment; Emergency Spillway in Foreground, Intake Riser to Right and Outlet Channel to Left

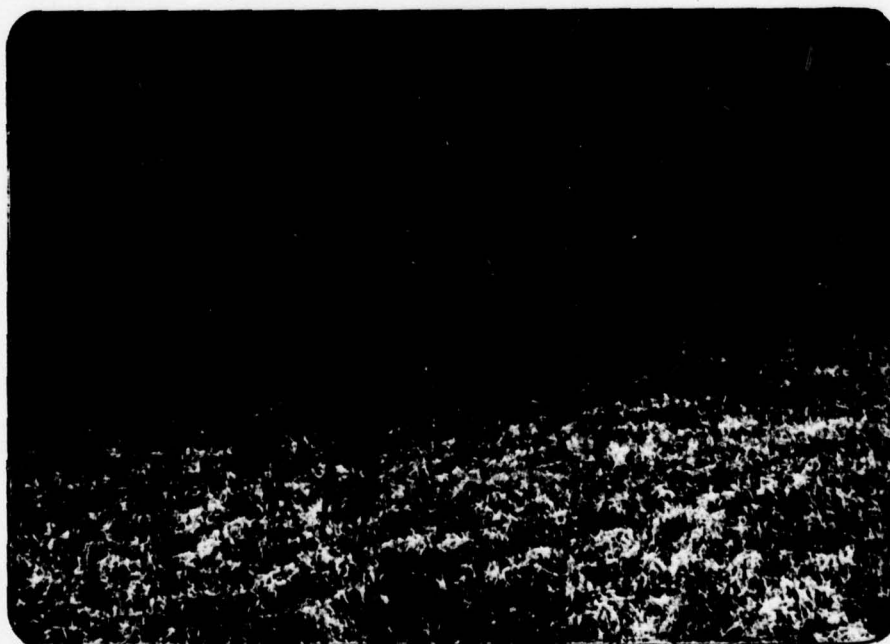
- Photo 1 - Intake Riser Assembly  
(Orange marks above existing pool indicate previous highest water level.)
- Photo 2 - Intake Riser Assembly as seen from Emergency Spillway  
(View shows high stage inlets)
- Photo 3 - St. Anthony Falls (SAF) Type Outlet Structure  
(The majority of cover on the embankment is crown vetch which remains dormant until late spring. The crown vetch therefore is brown in the photos and the eroded areas that were reseeded with grasses have already turned green, thereby accenting the eroded areas in the pictures.)
- Photo 4 - Outlet Structure and Downstream Area  
(Note vegetation growing through riprap and reseeded area in embankment.)
- Photo 5 - Downstream Channel as seen from Emergency Spillway Exit
- Photo 6 - Entrance to Emergency Spillway Channel as Viewed from Atop Left Abutment  
(Wet area is near center of photo.)
- Photo 7 - Eroded Pedestrian Path on Downstream Face Leading from Parking Lot to Crest of Dam  
(Green grass on both sides of path indicates that attempts were made to control erosion. Recommend permanent steps be installed in this area.)
- Photo 8 - Marshy Area Located in Entrance Channel of Emergency Spillway

Note: Photographs were taken on 19 April 1979.

## LAKE WILHELM DAM



**PHOTO 1. Intake Riser Assembly**  
**(Orange Marks Above Existing Pool Indicate Previous Highest Water Level)**

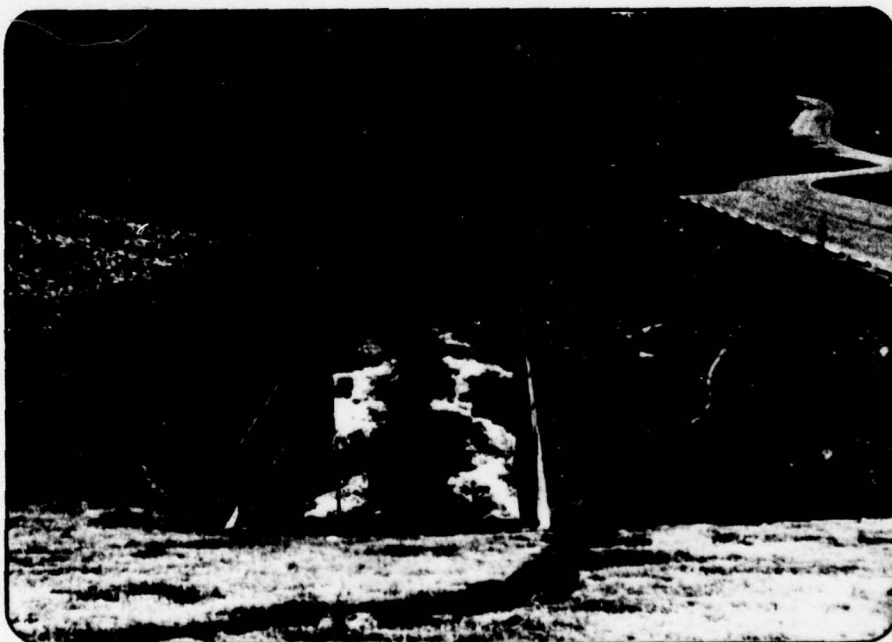


**PHOTO 2. Intake Riser Assembly as Seen from Emergency Spillway**  
**(View Shows High Stage Inlets)**

## LAKE WILHELM DAM



**PHOTO 3. St. Anthony Falls (SAF) Outlet Structure** (The majority of cover on the embankment is crown vetch which remains dormant until later in the spring. The crown vetch therefore is brown in the photos and the eroded areas that were reseeded with grass have already turned green, thereby accenting the eroded areas in the photos.)



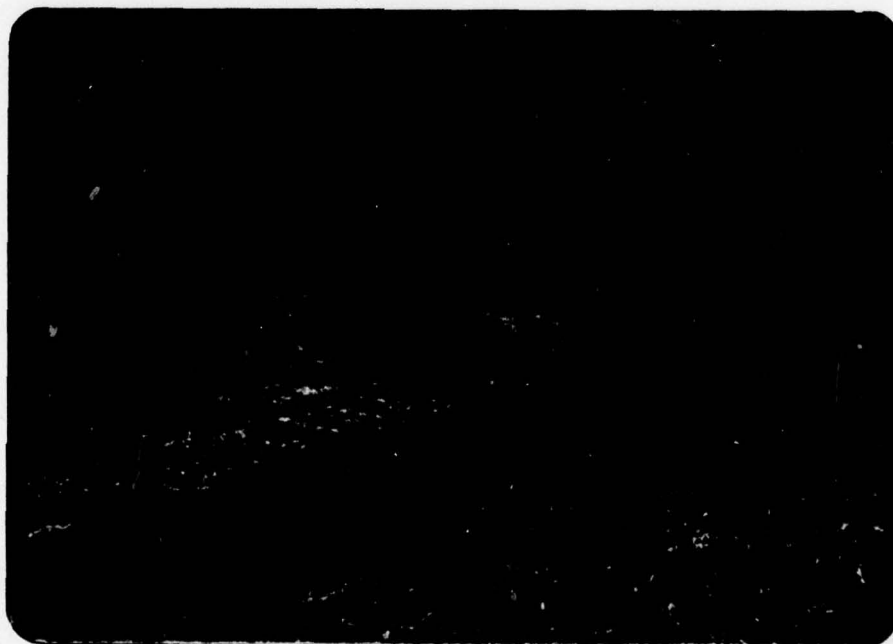
**PHOTO 4. Outlet Structure and Downstream Area**  
(Note Vegetation Growing Through Riprap and Reseeded Area in Embankment)



## LAKE WILHELM DAM

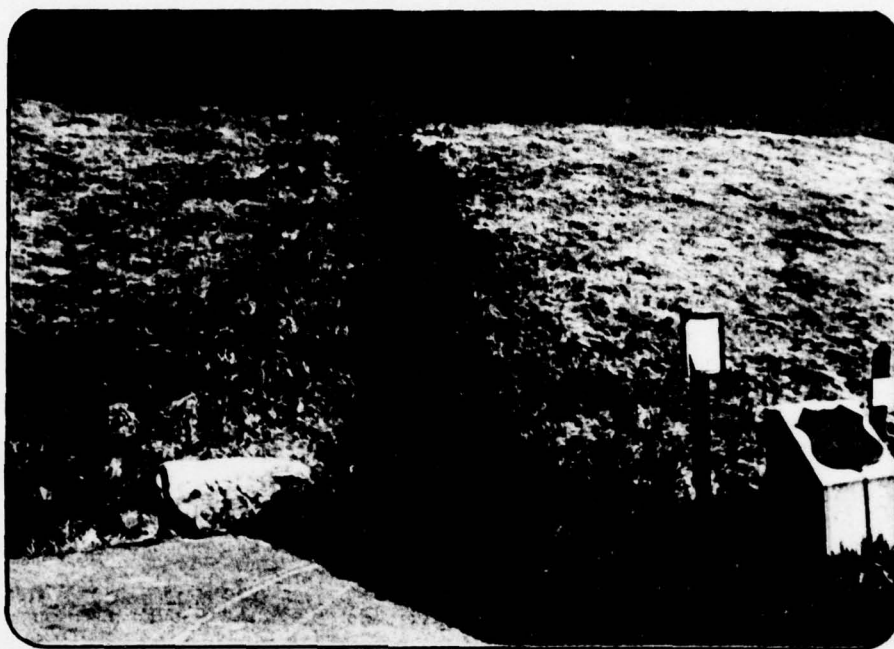


**PHOTO 5. Downstream Channel as seen from Emergency Spillway Exit**



**PHOTO 6. Entrance to Emergency Spillway Channel as Viewed from atop Left Abutment  
(Wet Area is near Center of Photo)**

## LAKE WILHELM DAM



**PHOTO 7. Eroded Pedestrian Path on Downstream Face Leading from Parking Lot to Crest of Dam (Green grass on both sides of path indicates that attempts were made to control erosion. Recommend permanent steps be installed in this area.)**



**PHOTO 8. Marshy Area Located in Entrance Channel at Emergency Spillway**

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



MICHAEL BAKER, JR., INC.  
THE BAKER ENGINEERS

Box 280  
Beaver, Pa. 15009

Subject Lake Wilhelm Dam S.O. No. \_\_\_\_\_  
(PA-475) Sheet No. \_\_\_\_\_ of \_\_\_\_\_  
Drawing No. \_\_\_\_\_  
Computed by \_\_\_\_\_ Checked by \_\_\_\_\_ Date \_\_\_\_\_

### Table of Contents

Remarks	1
Hydrologic Data	2
Stage vs. Storage, area	3
Stage vs. Discharge	4
Top of Dam Profile	5
Map of downstream damage area	6

MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

Box 280  
Beaver, Pa. 15009

Subject Lake Wilhelm Dam S.O. No. \_\_\_\_\_  
Sheet No. 1 of 6  
Drawing No. \_\_\_\_\_  
Computed by REH Checked by \_\_\_\_\_ Date \_\_\_\_\_

Lake Wilhelm Dam was designed by the SCS in accordance with standard criteria circa 1966. The design flood was based on rainfall essentially equal to the probable maximum precipitation. Therefore, the dam should be capable of passing the probable maximum flood (PMF) without overtopping. In view of the above no additional hydrologic or hydraulic calculations were performed for this report. The SCS calculations were reviewed, however, and summarized in this appendix.

In addition, the conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.



Subject Lake Wilhelm Dam  
Hydrologic Data

S.O. No. \_\_\_\_\_

Sheet No. 2 of 6

Drawing No. \_\_\_\_\_

Computed by \_\_\_\_\_ Checked by \_\_\_\_\_ Date \_\_\_\_\_

Pertinent Hydrologic Data

Drainage area = 56.5 sq. mi.

Runoff curve no. = 78 (CN)

Storm duration = 6 hours

Time of concentration = 6 hours

Hydrograph	Rainfall (in.)		Runoff (in.)	Peak flow (cfs.)
	Point	Areal		
<u>Emergency spillway</u>	<u>9.2</u>	<u>7.81</u>	<u>5.23</u>	<u>25,060</u>
<u>Freeboard</u>	<u>25.0</u>	<u>21.25</u>	<u>18.21</u>	<u>108,415</u>

For additional information refer to the  
SCS Design Report for Lake Wilhelm Dam.



MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

Box 280  
Beaver, Pa. 15009

Subject Lake Wilhelm Dam

S.O. No. \_\_\_\_\_

Stage vs. Storage, Area

Sheet No. 3 of 6

Drawing No. \_\_\_\_\_

Computed by \_\_\_\_\_ Checked by \_\_\_\_\_ Date \_\_\_\_\_

stage (ft.)	Storage (Ac-ft.)	Area (Ac.)
1170	0	18.3
1175	629.5	313.6
1180	3470.0	742.5
1185	8153.0	1130.6
1190	14699.0	1487.8
1195	23116.5	1879.3
1200	33679.5	2345.8
1210	61718.5	3262.0

Note: The above information was taken  
from the SCS Design Report for  
the Lake Wilhelm Dam.

MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

Box 280  
Beaver, Pa. 15009Subject Lake Wilhelm Dam

S.O. No. \_\_\_\_\_

Outlet Works and spillwaySheet No. 4 of 6Discharge Ratings

Drawing No. \_\_\_\_\_

Computed by \_\_\_\_\_

Checked by \_\_\_\_\_

Date \_\_\_\_\_

Elev. (ft.)	Discharge		Remarks
	Outlet Works (cfs.)	Spillway (cfs.)	
1192.0	0		Normal pool
1192.5	132		
1193.0	372		
1193.5	683		
1194.0	993		
1194.5	1066		
1195.0	1231		
1195.5	1505		
1196.0	1618		
1196.5	1722		
1197.0	1828		High stage inlet crest
1197.5	1930		
1198.0	1961		Spillway Crest
1199.0	1982	0	
1200.5	2032		
1205.0	2175		
1211.5	2365	8635	Top of Dam

The above information was taken from the  
SCS Design Report for Wilhelm Dam.  
Information concerning the origin of  
this data is also contained in the  
design report.



MICHAEL BAKER, JR., INC.  
THE BAKER ENGINEERS

Box 280  
Beaver, Pa. 15009

Subject LAKE WILHELM DAM

TOP OF DAM PROFILE

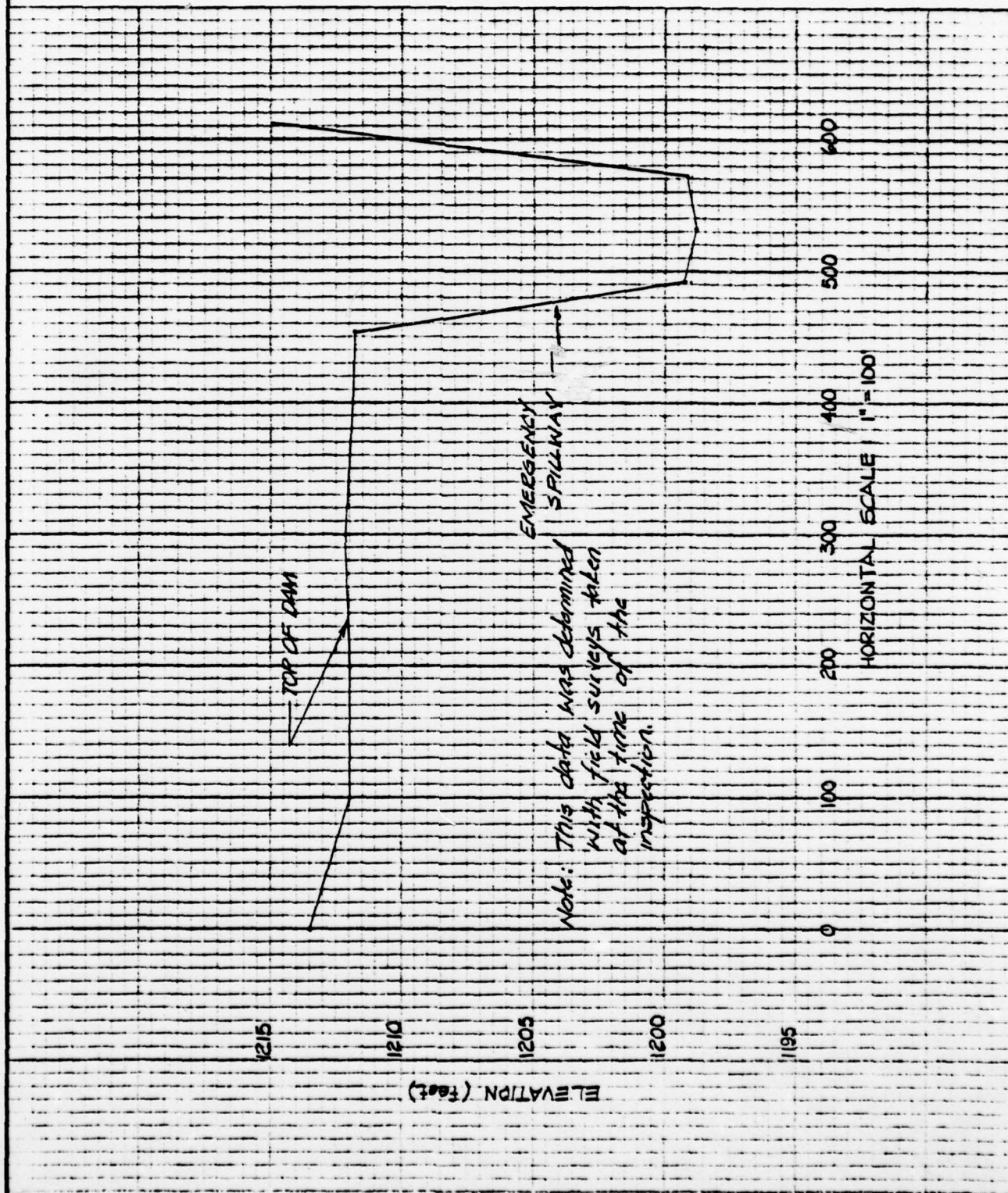
S.O. No. \_\_\_\_\_

Sheet No. 5 of 6

Drawing No. \_\_\_\_\_

Computed by SCB Checked by REH

Date 5-9-79

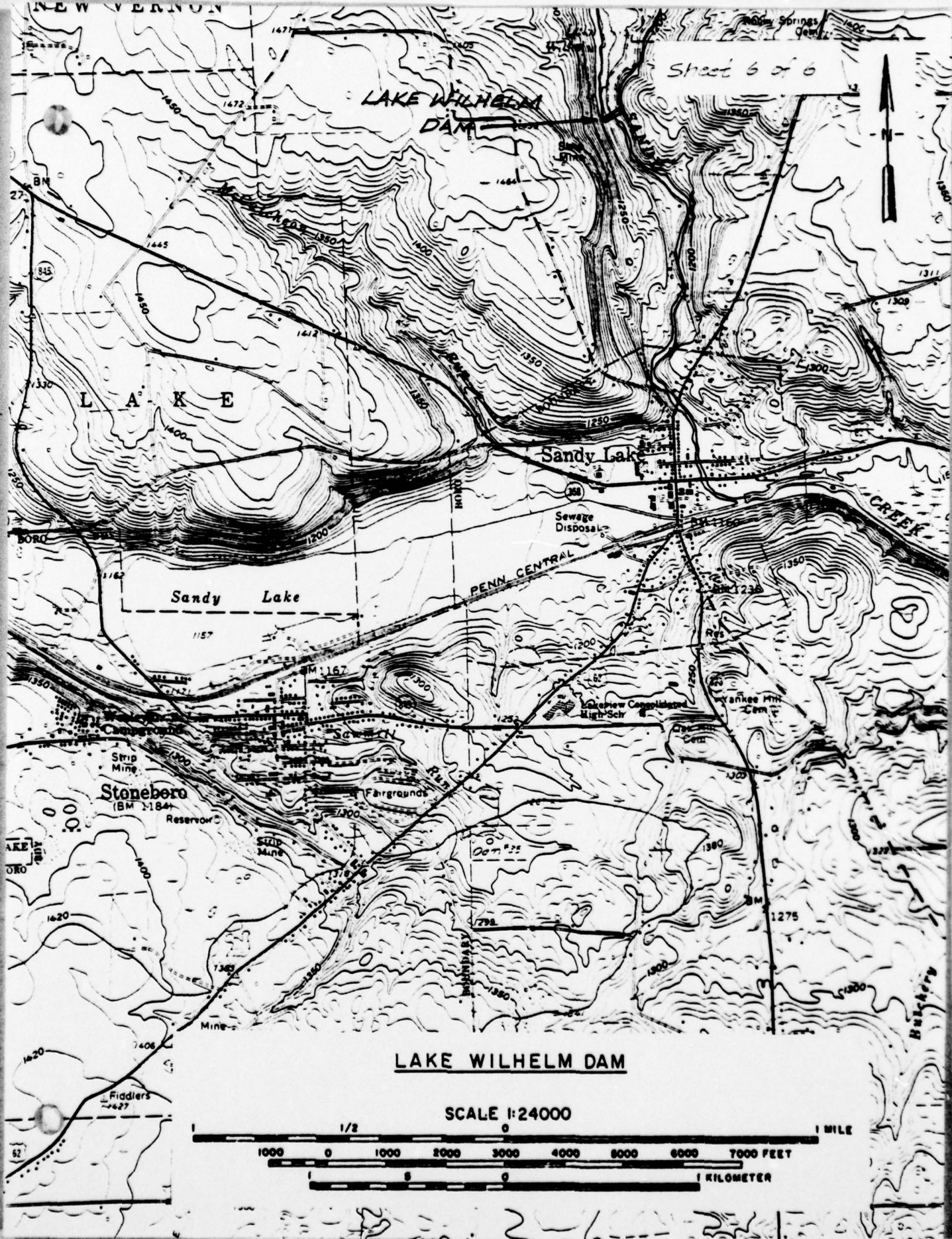




NEW VERNON

Sheet 6 of 6

LAKE WILHELM  
DAM



L A K E

Sandy Lake

Sandy Lake

PENN CENTRAL

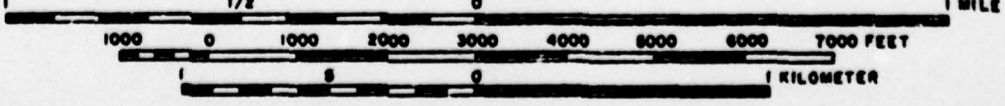
Stoneboro

(BM 1184)

Reservoir

LAKE WILHELM DAM

SCALE 1:24000



APPENDIX E

REGIONAL GEOLOGY

REGIONAL GEOLOGY

Lake Wilhelm Dam was constructed across the valley of Sandy Creek, an area of thick glacial deposits which, in places, exceeds 60 feet in depth. A geologic report prepared by the SCS for design of the dam, describes in detail the complex glacial history of the site. As the result of several glacial advances and retreats, combined with erosion and impoundment of meltwater in the valley, the soils at the dam site are a complex series of discontinuous beds of sands, gravels, and varved lacustrine silts and clays separated by erosional surfaces. Some peat deposits were also formed during deposition of recent alluvium.

Bedrock units underlying the glacial till in this section of the Appalachian Plateaus physiographic province are interbedded shale and sandstone members of the Shenango formation, Mississippian system. An outcrop of sandstone was reported above the area of the right abutment.

In several of the borings, artesian flow occurred from the zone of weathered bedrock and some seepage was observed below the sandstone outcrop.

The dam site is shown in relationship to the regional geology on the map on the following page.





# LEGEND

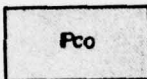
PENNSYLVANIAN

Pottsville Group



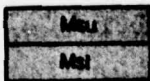
## MERCER FORMATION

*Mostly dark-gray shale, but contains thin beds of coal and limestone and lenses of sandstone. Generally unimportant as an aquifer, but locally yields may be sufficient for domestic and stock use.*



## CONNOQUENESSING FORMATION

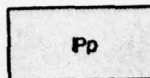
*Medium- to fine-grained gray sandstone containing lenses of dark-gray shale and discontinuous beds of Quakertown coal. Yields moderate quantities of water that is locally high in iron content.*



## SHENANGO FORMATION

*The upper member ( Msu ) is composed of soft medium- to dark-gray shale with interbeds of siltstone and lenses of fine-grained sandstone. Unimportant as an aquifer. The lower member ( Msl ) is composed of medium- to fine-grained light-gray sandstone and medium- to dark-gray shale and siltstone. Yields moderate to large quantities of water that is locally high in iron content at shallow depths.*

MISSISSIPPIAN



## POTTSVILLE UNDIFFERENTIATED

*Sandstones, possibly containing some relatively thick beds of shale; correlation with Connoquenessing, Mercer, and Homewood Formations uncertain. Unimportant as an aquifer.*